HARDWARE TECHNICAL REFERENCE MANUAL

Version 14.00 - June 2015

XTnano

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Regional Contacts

You will find the full list of addresses and phone numbers on the following webpage: http://www.evs.com/contacts.

User Manuals on EVS Website

The latest version of the user manual, if any, and other user manuals on EVS products can be found on the EVS download center, on the following webpage: http://www.evs.com/downloadcenter.

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What's New?

In the Technical Reference manual, the icon NEW ! has been added on the left margin to highlight information on new and updated features.

The changes linked to new features in version 14.00 are listed below:

New H3XP controller board

- See section "H3XP Board" on page 60

New A3X audio board

- See section "Audio Codec Board" on page 58

1080p Support on XTnano

- See section "Presentation" on page 1
- See section "XFile3 Capacities" on page 22
- See section "COD Connectivity in 3D and 1080p Dual Link" on page 53
- See section "COD Connectivity in 3D and 1080p Single Link 3G-SDI" on page 55

The following changes unrelated to new features for release 14.00 have been brought to this technical reference manual. They are not highlighted with the **New** icon:

Updated Section on Rear Panel

- See section "4U Rear Panel Layout" on page 28

Updated List of GbE Switches

- See section "Switches" on page 39

Updated Data on Gigabit Ethernet Transfers

- See section "Gigabit Ethernet Transfers" on page 19

1. Overview

1.1. Presentation

Welcome to the EVS range of products and thank you for using an EVS XTnano server. We will do our best to satisfy your video production needs and we look forward to continuing working with you.

NEW !

The EVS XTnano servers are full digital in PAL (625i), NTSC (525i), 720p, 1080i, and 1080p standards. These multi-channel, disk-based video servers are ideal for a wide range of broadcast applications, from sports and live production to playout and transmission.

The XTnano servers are 6 or 4-channel HD/SD slow motion replay servers from EVS. Optimized for multiple applications, such as ingestion of audio/video files, live feed recording, live slow motion and super motion, clipping and playlist playout control, XTnano servers offer a flexible configuration.

They natively support a wide range of HD Intra codecs, such as Mjpeg, Avid DNxHD®, VC-3, Apple ProRes®, MPEG-2 intra, Panasonic DVCPRO HD, AVC-Intra Class 100, as well as SD Intra codecs. The XTnano server can be purchased with a single codec license.

With its GbE networking capabilities, A/V files can be played and simultaneously transferred to other EVS servers, as well as all standard NLE and archive systems.

2. Safety and Compliance

2.1. Safety

This equipment has been designed and tested to meet the requirements of the following:

- EN 60950 (European): Safety of information technology equipment including business equipment.
- IEC 950 (International): Safety of information technology equipment including business equipment.

In addition, this equipment has been designed to meet the following:

- UL 1950 - USA (USA): Safety of information technology equipment including business equipment.

2.2. EMC Standards

This equipment complies with following EMC standards:

Standard	Area	Title
EN 55022	European	Emission Standard
EN 61000-3-2	European	Electromagnetic Compatibility (EMC) Part 3 (Limits); Section2 ; limits for harmonic current emissions (equipment input current <16A per phase)
EN 61000-3-3	European	European Electromagnetic Compatibility (EMC) Part 3 (Limits), Section 3; limitation of voltage fluctuation and flicker in low-voltage supply systems for equipment with rated current of 16 A.
EN 61000-4-3	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 3; Testing and measurement techniques - Radiated, radio-Frequency, electromagnetic field immunity test.
EN 61000-4-4	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 4; Testing and measurement techniques - Electrical fast transient/burst immunity test.
EN 61000-4-5	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 5; Testing and measurement techniques - Surge immunity test.
EN 61000-4-6	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 6 ; Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

Standard	Area	Title
EN 61000-4-7	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 7; harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto.
EN 61000-4-11	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 11 ; Voltage dips, short interruptions and voltage variations immunity tests.
EN 50082-1	European	European Generic Immunity Standard – Part 1: Domestic, commercial and light industry environment.
FCC	USA	Conducted and radiated emission limits for a Class A digital device, pursuant to the Code of Federal Regulations (CFR) Title 47 – Telecommunications, Part 15: Radio Frequency devices, subpart B-Unintentional Radiators.

2.3. EMC Warning

Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

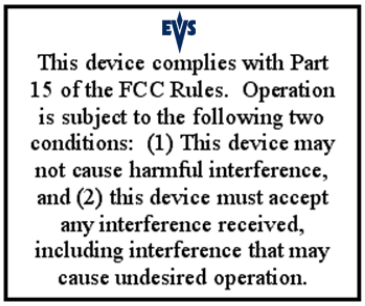
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

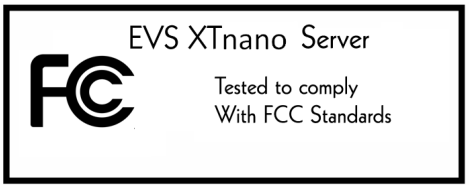
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.4. FCC Marking

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

The following labels are affixed on the equipment:


This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



2.5. CE Marking

The CE marking is affixed to indicate compliance with the following directives:

- 89/336//EEC of 3 May 1989 on the approximation of the laws of the Members States to electromagnetic compatibility.
- 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Members States relating to electrical equipment designed for use within certain voltage limits.
- 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

3. Hardware Specifications

3.1. Mechanical Dimensions and Weights

3.1.1. Rack Mount 4U Main Frame

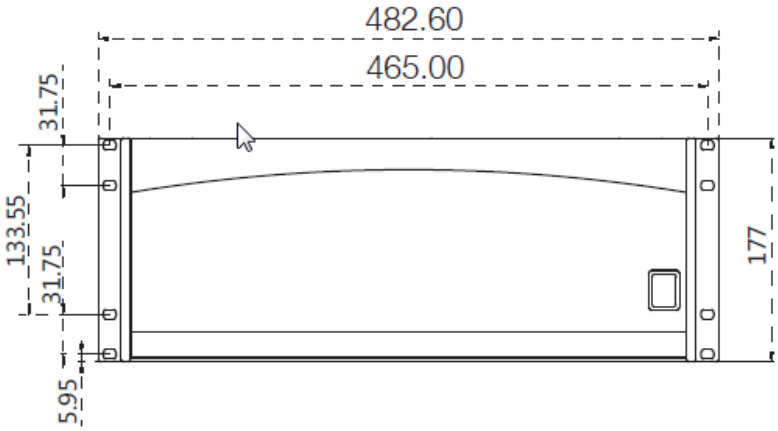
Weight

4U - 19 inches chassis with 6 HDD on RSAS board: 31 kg / 68.3 lb.

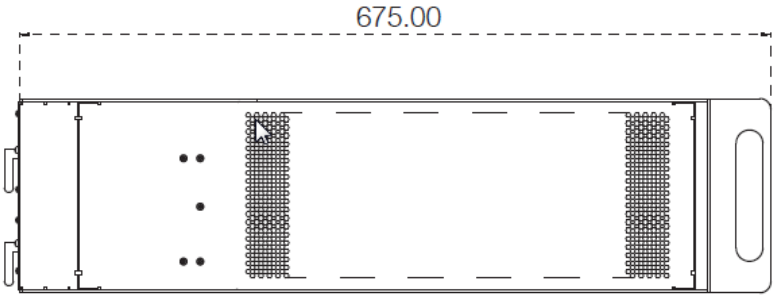
Dimensions

The following drawings provide the various dimensions, in mm, of the XTnano server with a 4U chassis.

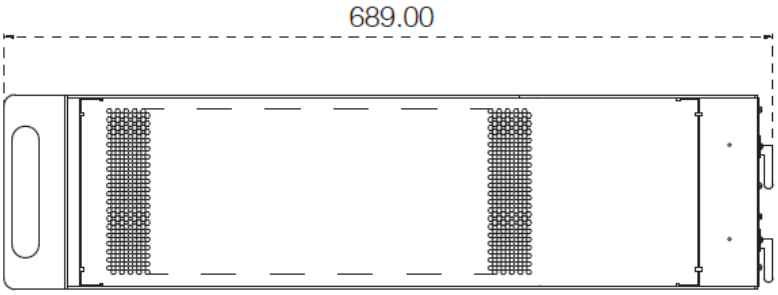
Front View



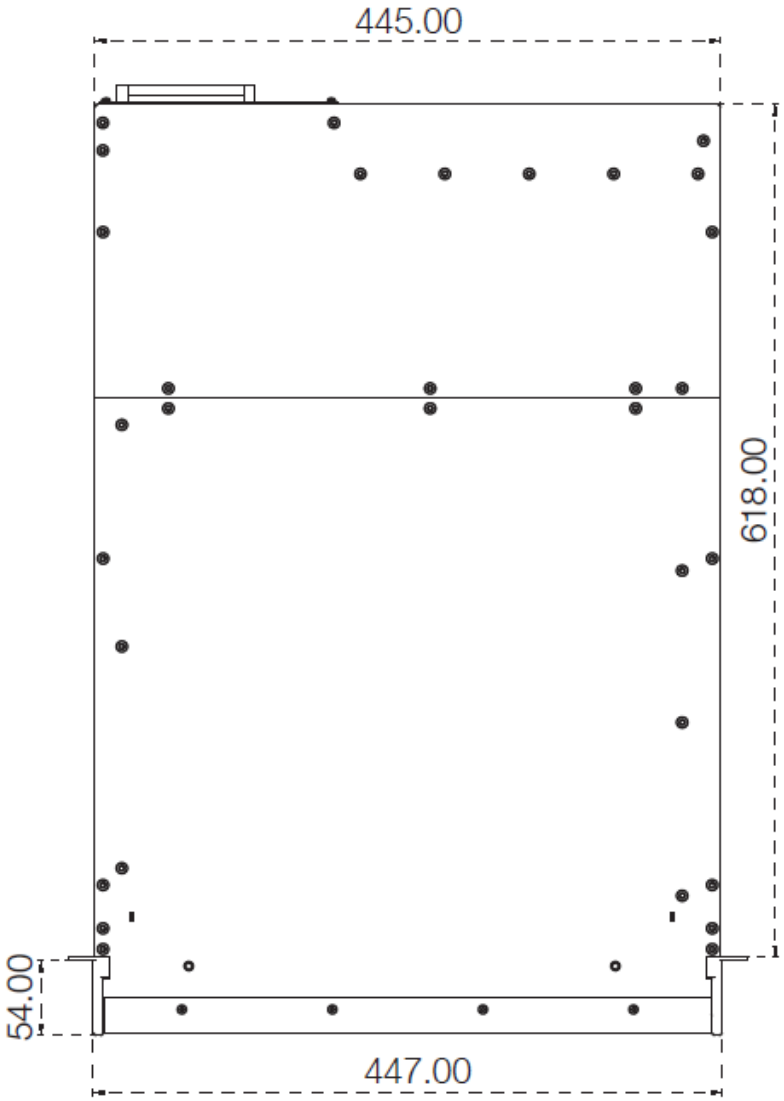
Left View



Right View



Back View

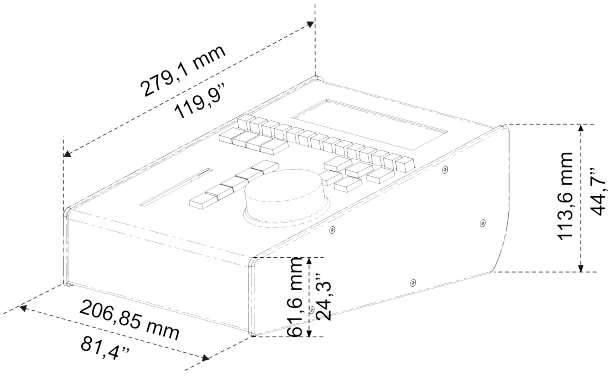


3.1.2. Control Devices

The following control devices can optionally be connected to your server to control it.

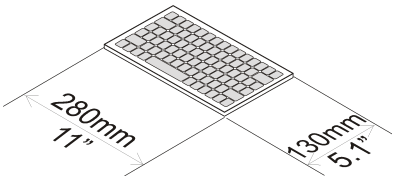
Nano Remote Control Panel

Weight: 3.4 kg / 7.5 lb.



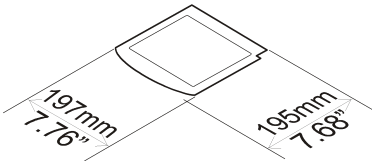
Keyboard

Weight: 0.4 kg / 0.9 lb.



Tablet

Weight: 0.3 kg / 0.66 lb. (Ref: Wacom® CTF-430 Bamboo One)



3.2. Power Supply

Redundant Power Supply

The server is fitted with two auto switching and hot-swappable power supplies.

The secondary hot-swappable power supply should be connected to the mains to allow automatic power switching to this second power supply should the first one fail.

Grounding

Warning
The protective earth must be connected to the ground before powering up the unit.
Ensure the disk recorder unit is properly grounded at all times to avoid electrical shock hazard.

Electrical Specifications

Rated voltage: 115 to 240 VAC (single phase)

Rated frequency: 47-63 Hz

Input connector: CEE 22/IEC 320 3-pin male receptacle

Connection to supply: Pluggable equipment Type A (EN 60950 §1.2.5): Equipment which is intended for connection to the building power supply wiring via a non-industrial plug and socket-outlet or a non-industrial appliance coupler or both. Correct mains polarity must always be observed. Do not use reversible power plugs with this equipment.

Class of equipment: Class 1 equipment (EN 60950 § 1.2.5): electric shock protection by basic insulation and protective earth.

Electrical Consumption

The following electrical specifications are valid for the XTnano server:

Data Type	Voltage	Value
Inrush current (PSU plugged on power grid)	230 V	3.0 A
Maximal current (full load, CPU at 100%)	230 V	1.3 A
Inrush current (PSU plugged on power grid)	115 V	6.3 A
Maximal current (full load, CPU at 100%)	115 V	2.8 A
Maximal power consumption (full load, CPU at 100%)	-	300 W

3.3. Environmental Conditions

Operating

- Temperature: 10°C to + 45°C (50°F to 113°F) ambient with free air flow
- Relative humidity: 0% to 90% (non-condensing)
- Cooling requirements: Forced cooling air flow from right to left when looking at the EVS server from the back panel.
- Handling/movement: Designed for fixed use when in operation

Storage and Transport

- Temperature: 0°C to +70°C (32°F to 158°F)
- Relative humidity: 0% to 90% (non-condensing)

4. Software Specifications

4.1. Video Specifications

Video Standards

The following table lists the video specifications both in SD and in HD format for your XTnano server.

	Standard Definition	High Definition
Video Formats	525i 29.97fps (NTSC) 625i 25fps (PAL)	720p 50/59.94fps 1080i 50/59.94fps
Digital Interface	10-bit 4:2:2 Serial (ST 259:2008). Full frame synchronizer at input.	10-bit 4:2:2 Serial (ST 292-1:2011). Full frame synchronizer at input.
Number of Channels	4 or 6* channels, reversible REC/PLAY	4 or 6* channels, reversible REC/PLAY
Monitoring & Down-converters	1 SD SDI per channel, with OSD	1 HD SDI output per channel, with OSD
Reference	Analog Black Burst	Analog Black Burst and HD Tri-Level Sync
Graphics Board	n.a.	n.a.

* From a hardware point of view,four codec modules, remain available on the backplane. However, it is possible to increase the number of connected record channels by connecting distinct recorders or players to the primary **and** the secondary connectors of a codec module.

Such configurations, available with the XREC license code (30), are described in the Configuration manual, Supported Configurations chapter.

SMPTE Standards

The following table lists the SMPTE standards supported by your server.

Configuration	SMPTE standard
SD SDI	ST 259:2008 (525i 59.94 Hz; 625i 50 Hz)
HD SDI	ST 292-1:2011, ST 292:2012 (720p 50 and 59.94 Hz; 1080i 50 and 59.94 Hz)
Embedded audio HD	ST 299-0:2010, ST 299-1:2009
AES/EBU audio	ST 272:2004
LTC	ST 12-1:2008, ST12-2:2008
D-VITC	ST 266:2012
Ancillary TC in HD	RP 188
Vertical Ancillary Data	ST 334:2000
VC-3	ST 2019-1:2008
Dual Link 1.5 Gb/s	ST 372:2011
Mapping of Audio Metadata into Vertical Ancillary data	ST 2020-2:2008, ST 2020-3:2008

4.2. Audio Specifications

Audio Analog and Digital Configurations

The following optional audio configuration is available:

- **Configuration DA-15 AES/EBU + DA-15 Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E on 4 DA-15 connectors
  - 8 input and 8 output analog balanced channels on 4 DA-15 connectors

Additional Audio Specifications

- 4 additional analog balanced output channels for monitoring
- All audio connectors on mainframe
- Up to 64 embedded audio channels (4*16 audio mono channels per video channel) in 4-channel configurations.
- Up to 48 embedded audio channels (6*8 audi mono channels per video channel) in 6-channel configurations.

Audio Processing

- Uncompressed audio
- 24 bit processing and storage
- Sample rate converter from 25-55 kHz to 48 kHz
- Audio scrub
- Audio mix

4.3. Video Codecs and Bitrates

4.3.1. Supported Codecs

Codecs and Related License Codes

The XTnano server supports natively the video codecs presented in the table below when the required license code is valid.

The XTnano server can be purchased with a single codec license.

Codec	SD	HD	Code Protection
IMX	√	-	Code 11
Mjpeg SD	√	-	Code 10
DVCPro 50	√	-	Code 9
Mjpeg Standard HD **Mjpeg EVS HD**	-	√	Code 10
Mpeg-2 Intra	-	√	Code 12
Avid DNxHD®	-	√	Code 5
Apple ProRes 422	-	√	Code 6
DVCPro HD	-	√	Code 8
AVC-Intra	-	√	Code 13

Target Bitrate Range and Default Values

The target bitrate of the encoded video stream can be set by the user within the accepted range: 8 to 100 Mbps for standard definition, 40 to 250 Mbps for high definition with the exception of Apple ProRes, Avid DNxHD® and DVCPro codecs working with defined bitrates.

The default values are Mjpeg 30 Mbps for standard definition and Mjpeg 100 Mbps for high definition.

Content Transfer Encoding and File Header

It is possible to perform the encoding process in 8-bit or 10-bit and to write a 10-bit file on selected codecs.

The following table summarizes the proposed configurations, valid for encoding and file header:

Codec	Encoding & File Header
DNxHD 120/145	8-bit
DNxHD 185/220	8-bit
DNxHD 185x/220x	10-bit
ProRes LT	10-bit
ProRes SQ	10-bit
ProRes HQ	10-bit
DVCPro HD	8-bit
Mjpeg	8-bit
Mpeg-2 Intra	8-bit
AVC-Intra 100	10-bit

4.3.2. Maximum Bitrates

These maximum values are valid for XTnano servers running Multicam version 12.02 or higher. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

Codec	Format	2 ch	4 ch	4ch (3D)	4ch (3D SLSM 3x)	6 ch
SD Mjpeg	PAL	100	100	N/A	N/A	100
	NTSC	100	100	N/A	N/A	100
HD Mjpeg	PAL	225	225	180	100	180
	NTSC	250	250	180	100	180
HD Mpeg-2 Intra	PAL	225	225	180	N/A	180
	NTSC	250	250	180	N/A	180
Avid DNxHD®	PAL	185	185	185	100	185
	NTSC	220	220	220	100	220
Apple ProRes 422	PAL	185	185	185	85	185
	NTSC	220	220	220	102	220
DVCPro 50	PAL	50	50	N/A	N/A	50
	NTSC	50	50	N/A	N/A	50
DVCPro HD	PAL	100	100	100	N/A	100
	NTSC	100	100	100	N/A	100
AVC-Intra 100	PAL	111	111	110	N/A	111
	NTSC	111	111	110	N/A	111

* This value can be achieved with internal SAS HDD disks with revision 10K.5.

4.3.3. Internal Bandwidth

General Description

This section helps you select the most appropriate bitrate for the native codec(s) on the EVS server, on the basis of the internal bandwidth, the channel configuration, and the calculated number of real-time channels at the EVS server level.

The section therefore presents tables including the following parameters:

1. **Video Bitrate:** codec bitrate set by the user in the **Codec** section of the **Server** tab in the Multicam Configuration window.
2. **Fields/Block:** numbers of video fields that can be stored in one disk block of 8 MB, taking into account 8 audio track, in 1080i.
3. **Actual Bandwidth:** actual disk/network bandwidth required for the real-time record or real-time playback of one video stream and its associated audio tracks.
4. **Max. RT Channels:** maximum number of video channels (real-time record or real-time playback) that one EVS server can support for a given frame rate and bitrate.

   The RT Channels calculation is based on the use of Seagate disks of 300 GB (10K5) configured in 4+1 raids. Such disks are able to write 400 MB/s.

Bandwidth and RT Channels at 50 Hz (PAL)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	50.00	85	35	11.4	35
HD Mjpeg Standard	50.00	100	12	33.3	12
HD Mpeg-2 Intra	50.00	100	12	33.3	12
DVCPro HD	50.00	100	31	12.9	31
AVC Intra 100	50.00	111	30	13.3	30
Avid DNxHD® 120	50.00	120	27	14.8	27
Apple ProRes 422 SQ	50.00	120	24	16.6	24
Avid DNxHD® 185	50.00	185	18	22.2	18
Apple ProRes 422 HQ	50.00	185	16	25.0	16

Bandwidth and RT Channels at 150 Hz (PAL SLSM 3x)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	150.00	85	12	34.3	11.6
HD Mjpeg Standard	150.00	100	4	100.0	4.0
HD Mpeg-2 Intra	150.00	100	4	100.0	4.0
DVCPro HD	150.00	100	10	38.7	10.3
AVC Intra 100	150.00	111	10	40.0	10.0
Avid DNxHD® 120	150.00	120	9	44.4	9.0
Apple ProRes 422 SQ	150.00	120	8	50.0	8.0
Avid DNxHD® 185	150.00	185	6	66.6	6.0
Apple ProRes 422 HQ	150.00	185	5	75.0	5.3

Bandwidth and RT Channels at 59.94 Hz (NTSC)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	59.94	85	35	13.7	29.2
HD Mjpeg Standard	59.94	100	14	34.2	11.6
HD Mpeg-2 Intra	59.94	100	14	34.2	11.6
DVCPro HD	59.94	100	35	13.7	29.7
AVC Intra 100	59.94	111	36	13.3	30.3
Avid DNxHD® 145	59.94	145	27	17.7	22.5
Apple ProRes 422 SQ	59.94	145	24	20.0	20.0
Avid DNxHD® 220	59.94	220	18	26.6	15.0
Apple ProRes 422 HQ	59.94	220	16	30.0	13.3

Bandwidth and RT Channels at 180 Hz (NTSC SLSM 3x)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	179.82	85	12	41.1	9.7
HD Mjpeg Standard	179.82	100	5	102.7	3.9
HD Mpeg-2 Intra	179.82	100	5	102.7	3.9
DVCPro HD	179.82	100	12	41.1	9.7
AVC Intra 100	179.82	111	12	40.0	10.0
Avid DNxHD®	179.82	145	9	53.3	7.5
Apple ProRes 422 SQ	179.82	145	8	60.0	6.6
Avid DNxHD®	179.82	220	6	80.0	5.0
Apple ProRes 422 HQ	179.82	220	5	90.0	4.4

Real-Time Channel Calculation

Rule

The maximum server bandwidth depends on the disks. Based on the assumption that Seagate disks of 300 GB (10K5) are used in 4+1 raids, the disks will be able to write 400 MB/s, and the maximum server bandwidth is therefore 400 MB/s.

For a mixed configuration with standard and super motion channels on the same EVS server, the following calculation must be used to ensure that the settings do not exceed the maximum bandwidth of the server, that is to say 400 MB/s:

```
    (nbr of standard channels x their block-based bandwidth)
+ (nbr of super motion channels x their block-based bandwidth)
```

Example with Standard and Supermotion Channels

Can I run an XTnano server with 2 record channels (1 super motion + 1 standard) + 2 play channels (1 super motion + 1 standard) in Avid DNxHD® with a video bitrate of 120 Mbps in PAL ?

Calculation:

- 1 standard rec/play at 120 Mbps uses 14.8 MB/s
- 1 super motion record/play at 120 Mbps uses 44.4 MB/s
- All channels will use: 2 x 14.8 + 2 x 44.4 = 118.4 MB/s.

Conclusion: this configuration is supported as it is lower than 400 MB/s.

4.3.4. Recording Capacities

Disk Storage

The maximum internal disk storage available on SAS disks, is as follows:

- 6 (5+1) x 300 GB SAS disks

RAID Level: 3

The video RAID uses striping process across 5 or 6 disk drives. The video and audio data is striped over the first 4 or 5 drives while the parity information is saved on the fifth or sixth drive.

If one drive is damaged, the video RAID can use the parity information to recover the missing information, so that operation can continue seamlessly without bandwidth loss.

Recording Capacity Figures

The following table shows the recording capacity, in hours:

- for 1 record channel, that is 1 video + 4 stereo audio tracks in SD; 1 video + 8 stereo audio tracks in HD
- with the **Operational Disk Size** parameter set to 100%.
- for 4+1 (5 disks) and 5+1 (6 disks) raid configurations without spare disk, in 50.00 Hz and 59.95Hz.

# Disks	# Disk size (GB)	# Usable disks	30Mbps	40Mbps	50Mbps	100Mbps	110Mbps	120Mbps	185Mbps
			4 audios	4 audios	4 audios	8 audios	8 audios	8 audios	8 audios
5	300	4	75	58	48	23	22	19	13
6	300	5	94	73	60	29	27	20	14

4.4. Network Transfers

4.4.1. Gigabit Ethernet Transfers

General Description

This section provides empirical figures on real-time transfers for backup and restore jobs processed by the GbE network. The GbE bandwidth however relies on the customer network behavior, which depends on external conditions, and partly on the EVS servers.

Warning
The observations and data focus on steady rates: the transfer performances with small clips will be lower as they generate a lot of starts and ends of sessions.

The section presents data in tables including the following parameters:

1. **Field Rate:** field frequency used, or number of video fields transferred per second.
2. **Video Bitrate:** codec bitrate set by the user in the **Codec** section of the **Server** tab in the Multicam Configuration window.
3. **RT Transfers:** maximum number of simultaneous transfers of A/V data that can be processed for the given frame rate and video bitrate through the GbE network.

   Calculation formula: `Maximum GbE bandwidth / actual block-based bandwidth = real-time transfers`
4. **Transfer Speed:** transfer speed for a single transfer expressed in faster than-real time speed. The calculation formula is the same with a reference GbE bandwidth that is slightly smaller.

Reference Bandwidth

The table below specifies the reference GbE bandwidth used for calculations in this section. However, the effective bandwidth depends on network behavior, which only partly relies on the EVS server.

Gigabit Connection Type	Real-Time Transfers		Single Transfer Speed	
	Backup	Restore	Backup	Restore
1GbE (10GbE board)	90 MB/s	70 MB/s	80 MB/s	70 MB/s

Backup Transfers

1GbE Connection

The maximum transfer speed through one 1GbE port of the 10GbE board on an XTnano server in 1080i, are summarized in the following table:

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
Apple ProRes 422 LT	50.00 Hz	85	11.4	7.8x
HD Mjpeg Standard	50.00 Hz	100	33.3	2.7x
HD Mpeg-2 Intra	50.00 Hz	100	33.3	2.7x
DVCPro HD	50.00 Hz	100	12.9	6.9x
AVC Intra 100	50.00 Hz	111	13.3	6.7x
Avid DNxHD® 120	50.00 Hz	120	14.8	6.1x
Apple ProRes 422 SQ	50.00 Hz	120	16.6	5.4x
Avid DNxHD® 185	50.00 Hz	185	22.2	4.0x
Apple ProRes 422 HQ	50.00 Hz	185	25.0	3.6x

Restore Transfers

1GbE Connection

The maximum transfer speed through one 1GbE port of the 10GbE board on an XTnano server in 1080i, are summarized in the following table:

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
Apple ProRes 422 LT	50.00 Hz	85	11.4	6.1x
HD Mjpeg Standard	50.00 Hz	100	33.3	2.1x
HD Mpeg-2 Intra	50.00 Hz	100	33.3	2.1x
DVCPro HD	50.00 Hz	100	12.9	5.4x
AVC Intra 100	50.00 Hz	111	13.3	5.2x
Avid DNxHD® 120	50.00 Hz	120	14.8	4.7x
Apple ProRes 422 SQ	50.00 Hz	120	16.6	4.2x
Avid DNxHD® 185	50.00 Hz	185	22.2	3.1x
Apple ProRes 422 HQ	50.00 Hz	185	25.0	2.8x

Simultaneous Backup and Restore

The backup sessions reach higher bandwidth and pre-empt the bandwidth against the restore sessions. On a ‘per session’ base, the system allocates between 3.75 and 6 times more bandwidth to backup session than to restore session.

4.4.2. XFile3 Capacities

Storage Capacity for 720p / 1080i at 50 Hz (PAL)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 50 Hz:

Codec	Fields/ Block	1 TB	2 TB
Apple ProRes 422 LT	35	25:29	50:58
HD Mjpeg Standard	12	8:44	17:29
HD Mpeg-2 Intra	12	8:44	17:29
DVCPro HD	31	22:34	45:08
AVC Intra 100	30	21:51	43:42
Avid DNxHD® 120	27	19:40	39:19
Apple ProRes 422 SQ	24	17:29	34:58
Avid DNxHD® 185	18	13:07	26:13
Apple ProRes 422 HQ	16	11:39	23:18

Storage Capacity for 720p / 1080i at 150 Hz (PAL Super Motion 3x)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 150 Hz:

Codec	Fields/ Block	1 TB	2 TB
Apple ProRes 422 LT	12	8:30	16:59
HD Mjpeg Standard	4	2:55	5:50
HD Mpeg-2 Intra	4	2:55	5:50
DVCPro HD	10	7:31	15:03
AVC Intra 100	10	7:17	14:34
Avid DNxHD® 120	9	6:33	13:07
Apple ProRes 422 SQ	8	5:50	11:39
Avid DNxHD® 185	6	4:22	8:44
Apple ProRes 422 HQ	5	3:53	7:46

Storage Capacity for 720p / 1080i at 59.94 Hz (NTSC)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 59.94 Hz:

Codec	Fields/ Block	1 TB	2 TB
Apple ProRes 422 LT	35	21:14	42:29
HD Mjpeg Standard	14	8:30	17:00
HD Mpeg-2 Intra	14	8:30	17:00
DVCPro HD	35	21:14	42:29
AVC Intra 100	36	21:51	43:42
Avid DNxHD® 120	27	16:23	32:46
Apple ProRes 422 SQ	24	14:34	29:07
Avid DNxHD® 185	18	10:55	21:50
Apple ProRes 422 HQ	16	9:43	19:25

Storage Capacity for 720p / 1080i at 180 Hz (NTSC Super Motion 3x)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 180 Hz:

Codec	Fields/ Block	1 TB	2 TB
Apple ProRes 422 LT	12	7:05	14:10
HD Mjpeg Standard	5	2:50	5:40
HD Mpeg-2 Intra	5	2:50	5:40
DVCPro HD	12	7:05	14:10
AVC Intra 100	12	7:17	14:34
Avid DNxHD® 120	9	5:28	10:55
Apple ProRes 422 SQ	8	4:50	9:43
Avid DNxHD® 185	6	3:38	7:17
Apple ProRes 422 HQ	5	3:14	6:28

NEW ! Storage Capacity for 1080p at 50 Hz (PAL)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 1080p video at a frame rate of 50 Hz:

Codec	Fields/ Block	1 TB	2 TB
AVC Intra 100	15	10:55	21:50
Avid DNxHD® 240	13	9:28	18:56
Apple ProRes 422 LT	18	13:07	26:13
Apple ProRes 422 SQ	12	10:24	20:48
Apple ProRes 422 HQ	8	5:50	11:40

NEW ! Storage Capacity for 1080p at 59.94 Hz (NTSC)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 1080p video at a frame rate of 59.94 Hz:

Codec	Fields/ Block	1 TB	2 TB
AVC Intra 100	18	10:55	21:50
Avid DNxHD® 365	14	8:30	17:00
Apple ProRes 422 LT	18	10:55	21:50
Apple ProRes 422 SQ	12	7:17	14:34
Apple ProRes 422 HQ	8	4:50	9:41

4.5. Video Interpolation

Introduction

The playing back of smooth slow motion pictures carries specific issues: since some fields must be repeated at regular interval to provide the video at the playback speed required by the operator, parity violation appears regularly on the output video signal. This issue is specific to interlaced formats (525i, 625i and 1080i) and does not concern progressive formats (720p).

If O and E represent respectively the odd and even fields of a standard video signal (50/60 Hz), we have:

The original video signal:

- O E O E O E O E O E O E O E

The output video signal at 50% speed:

- O **O** **E** E O **O** **E** E O **O** **E** E O **O** **E** E

The output video signal at 33% speed:

- O **O** O E **E** E O **O** O E **E** E O **O** O E

The output video signal at 25% speed :

- O **O** O **O** **E** E **E** E O **O** O **O** **E** E **E** E

Fields with parity violation are shown in bold, underlined letters. As it appears from the above table, whatever the playback speed (with the exception of the normal 100% playback speed), a number of fields violate the normal parity of the output signal. This parity violation induces a 1-line shift of the field, resulting in a vertical jitter of the picture. The jitter frequency depends upon the chosen playback speed.

To avoid this phenomenon and provide a stable output picture, EVS developed 2 types of line interpolator: 2-line and 4-line interpolators. The interpolation process can be enabled or disabled by the operator on all EVS slow motion systems.

2-Line Interpolator

The 2-line interpolator actually generates a new field, when the original field is in parity violation. Each line of this new field is calculated by a weighted average of the 2 neighboring lines. This process solves the problem of parity violation and vertical jitter, but the drawback is a reduction of the vertical resolution on the interpolated fields, that appear unfocused. Another side effect is the alternation of original fields (perfectly focused) and interpolated fields (unfocused), resulting in a "pumping" video signal.

4-Line Interpolator

The 4-line interpolator uses a more sophisticated calculation based on the 4 neighboring lines. By using suitable coefficients for the weight of each line in the resulting calculation, we apply this interpolation to all fields. The final result is a permanently, slightly unfocused picture. The advantage is a stable output signal with no jitter and no "pumping", but the vertical bandwidth is even more reduced.

The interpolator is of course always disabled at 100% playback speed, because there is no parity violation.

EVS uses the same techniques with the Super Slow Motion disk recorder, working with all models of Super Motion cameras (150/180 Hz). The only difference between the processing of Super Motion and normal scan (50/60 Hz) signals is that the interpolator is always disabled at 33% playback speed, because the Super Motion signal does not cause parity violation at this particular speed.

Whatever the choice, the resulting picture is thus always a compromise between stability and resolution. With EVS systems, the operator always has the choice between any of the 3 above described techniques: no interpolation, 2-line interpolation or 4-line interpolation. Even if the operator chooses to use the interpolation, this process will be automatically disabled when not necessary (100% playback for 50/60 Hz signal, 33% and 100% playback for 150/180 Hz signal).

Note
All professional VTRs use line interpolation in PlayVar mode to avoid vertical jitters.
Default value is interpolator off for all configurations except SLSM configurations in which 4-line interpolator mode is enabled.

5. Hardware Installation and Cabling

5.1. Rack Installation

Unpacking

Upon receipt of the equipment examine packing for obvious signs of damage. If damaged, do not unpack and inform the carrier immediately. Check thanks to the included packing list if all the items are present and if they show any mechanical damage. If yes, report damage or the missing parts to EVS or their appropriate representative.

Ventilation and Rack Mounting

Adequate ventilation is obviously required for optimum performance. As a result of this consideration, ensure that no other equipment is located close to the mainframe.

Warning

- Remember that fans are used to air cool the equipment and protect it from overheating.
- Do not block fans intakes during operations.

Having regard to the weight of the server chassis, support guides are required for this unit into the rack mount. The front ears of the unit are not designed to support its full weight. Applying full weight on these might result in bending the metal plate.

Boards Checking

The main power switch is located at the front side (lower right corner) of the unit.

Before turning on the power, open the front door of Video disk recorder unit to check if all boards fit into their guides. If a board is out of its guides, remove carefully the board and replace it in the same slot.

5.2. Rear Panel Description

5.2.1. Rear Panel Configurations

The XTnano server is available in 4U rack:

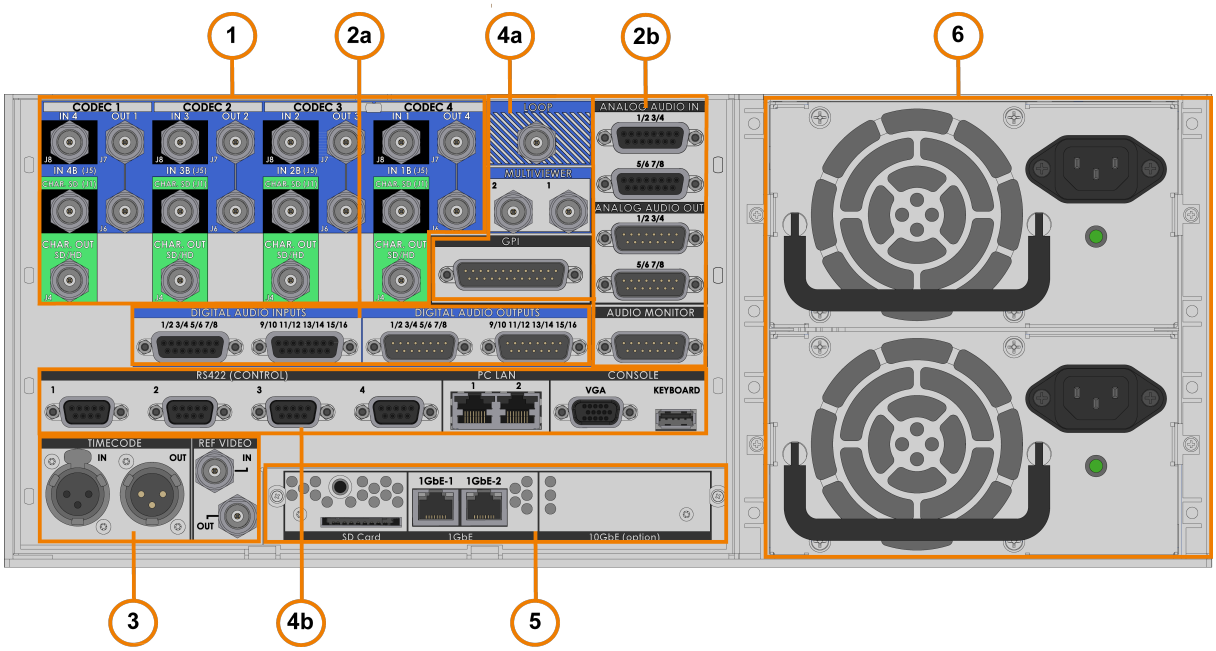
- with 4 or 2 codec modules and various audio connectors.

5.2.2. 4U Rear Panel Layout

Rear Panel Areas

The following drawing represents an example of a 4U rear panel available on an XTnano server.

The various areas of the rear panel are highlighted in the drawing and their respective variants are listed in the sections below along with a short description of the related connectors.

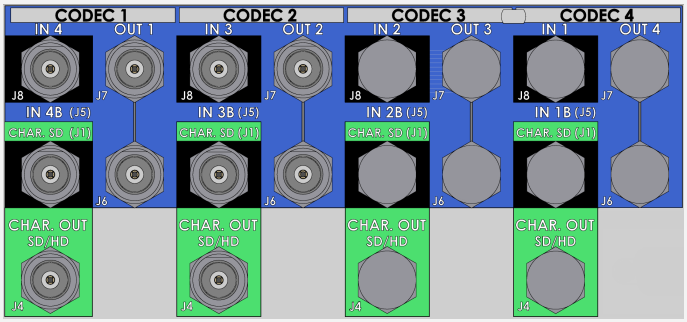
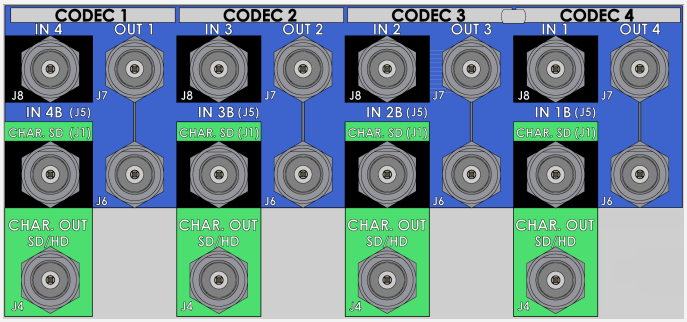


Video and Codecs 1

The codecs modules allow connections for recording and playback of video material. Each connector on a codec module is connected to the corresponding J connector on the COD A or COD B module of a V3X board.

See section "V3X Video and Reference Boards" on page 46 for more details on each connector specific usage according to the different configurations.

The following video and codecs connectors layouts are available according to your configuration:

Config	Layout	Description
222		
444		

Analog and Digital Audio 2a 2b

This section shows the available associations of audio connectors.

See section "Audio Specifications" on page 11 for more details on the available audio configurations.

See section "Audio Connections" on page 32 for more details on the DA-15 connectors pinout according to the different configurations.

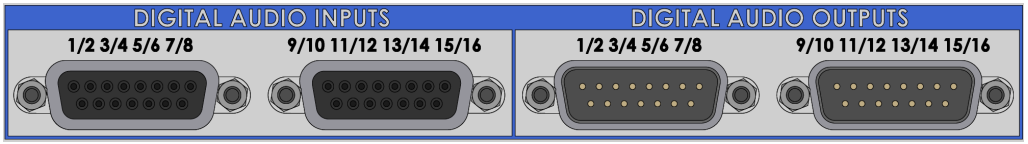
The audio connector layouts described in this section are available according to your configuration:

Analog DA-15 Connectors

- 4 multi-pin DA-15 connectors (2 in and 2 out)
- 1 multi-pin DA-15 for audio output connection for monitoring purposes

Digital DA-15 Connectors

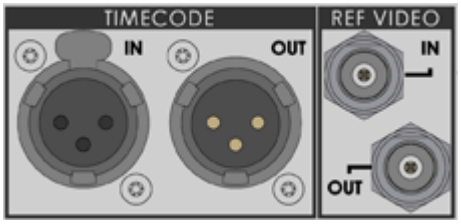
- 4 multi-pin DA-15 connectors (2 in and 2 out)



Timecode and Video Ref Connectors 3

The **Timecode** connectors allow the server to receive the LTC timecode reference signal and send the LTC timecode that corresponds to PGM1.

The **Ref Video** connectors allow the server to receive or send back the analog genlock reference signal.



Controls and Communications 4a

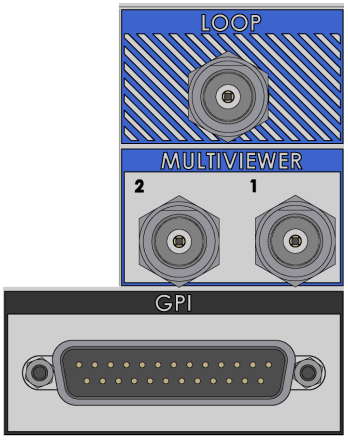
This rear panel part, located below the audio connectors, presents connectors that allow the EVS server to communicate with other devices. The connectors are described from top left to bottom right:

The **RS422 ports** allow the server to be remotely controlled through remote panels or third-party control devices. When a remote panel is used, it should be connected on the first RS422 port.

Two **PC LAN** connectors allow connection of the PC LAN interface of the EVS server to an Ethernet network.

The **Console** connectors allow a monitor and a keyboard to be connected to the server.

Controls and Communications 4b



This rear panel part, located on the right of the codec connectors, presents connectors that allow the EVS server to communicate with other devices. The connectors are described from top left to bottom right:

The **Loop** connector allows the loop of PGM1 on REC1 to be able to use the internal loop feature.

The **Multiviewer** connectors allow two monitors to be connected directly to the server, and to display PGM and REC channels as configured in the Multicam Configuration window, in the Monitoring tab, Multiviewer page. See the Multicam Configuration manual for a description of the configuration parameters.

The **GPI** connector allows GPI (General Purpose Interface) devices to send or receive electric pulses that will trigger commands on the server or to be connected with third-party devices.

Gigabit Ethernet Connector Module 5

The Gigabit Ethernet Connector module is located at the bottom center of the rear panel.

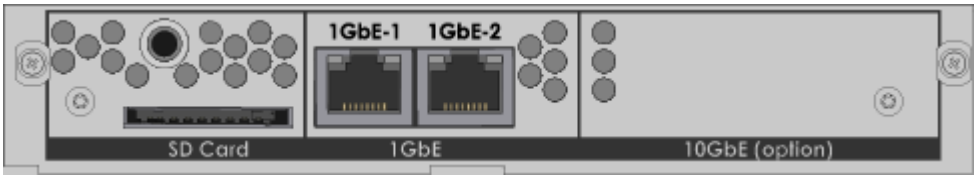
This area can have one of the following layouts:

NEW !

- It hosts a **light** version of the Gigabit connector module:

  The **Gigabit Ethernet** connector module allows the interconnection of servers, other EVS, and/or third-party systems into a Gigabit Ethernet network via:

  - 2 RJ45 connectors, each offering a global bandwidth of 1 GbE
  - SD card slot



Power Supplies 6

The server power supply is made of two hot-swappable units. Both of these units are connected to allow automatic power switching to the second power supply should the first one fail.

5.3. Video Connections

You fill find full details on video connections in the Configuration manual, in the chapter "Supported Configurations".

5.4. Audio Connections

5.4.1. Audio Channels

The XTnano server server manages up to 192 64 audio channels, depending on the chosen variant and the installed hardware.

The embedded audio modules and codecs can be used as input or output channels for embedded, digital (AES/EBU), or analog audio signals.

Depending on the server chassis or configuration, you can find the following audio connectors on the rear panel:

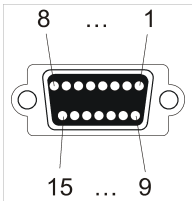
- Digital audio:
  - DA-15 connectors: 16 inputs (8 pairs) and 16 outputs (8 pairs) (110 Ohm balanced).
- Analog audio:
  - DA-15 connectors: 8 inputs (high-balanced) and 8 outputs (600 Ohm drive capable).
- Audio monitoring :
  - DA-15 connector: 4 analog mono outputs (600 Ohm drive capable) .
- Breakout cables with XLR connectors can be adapted on DA-15 connectors.

See also section "Audio Specifications" on page 11 for full information on the available audio hardware configurations.

The connectors are illustrated along with their respective pinouts in the following topics.

5.4.2. Digital Audio DA-15 Pinout

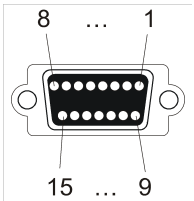
The digital audio DA-15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



Pin #	DA-15 connector #1 Inputs 1-8 (mono)	DA-15 connector #2 Inputs 9-16 (mono)	DA-15 connector #3 Outputs 1-8 (mono)	DA-15 connector #4 Outputs 9-16 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	AES input 1/2 +	AES input 9/10 +	AES output 1/2 +	AES output 9/10 +
3	Gnd	Gnd	Gnd	Gnd
4	AES input 3/4 +	AES input 11/12 +	AES output 3/4 +	AES output 11/12 +
5	Gnd	Gnd	Gnd	Gnd
6	AES input 5/6 +	AES input 13/14 +	AES output 5/6 +	AES output 13/14 +
7	Gnd	Gnd	Gnd	Gnd
8	AES input 7/8 +	AES input 15/16 +	AES output 7/8 +	AES output 15/16 +
9	AES input 1/2 -	AES input 9/10 -	AES output 1/2 -	AES output 9/10 -
10	Gnd	Gnd	Gnd	Gnd
11	AES input 3/4 -	AES input 11/12 -	AES output 3/4 -	AES output 11/12 -
12	Gnd	Gnd	Gnd	Gnd
13	AES input 5/6 -	AES input 13/14 -	AES output 5/6 -	AES output 13/14 -
14	Gnd	Gnd	Gnd	Gnd
15	AES input 7/8 -	AES input 15/16 -	AES output 7/8 -	AES output 15/16 -

5.4.3. Analog Audio DA-15 Pinout

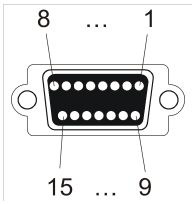
The analog audio DA-15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



Pin #	DA-15 connector #1 Inputs 1-4 (mono)	DA-15 connector #2 Inputs 5-8 (mono)	DA-15 connector #3 Outputs 1-4 (mono)	DA-15 connector #4 Outputs 5-8 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	Analog input 1 +	Analog input 5 +	Analog output 1 +	Analog output 5 +
3	Gnd	Gnd	Gnd	Gnd
4	Analog input 2 +	Analog input 6 +	Analog output 2 +	Analog output 6 +
5	Gnd	Gnd	Gnd	Gnd
6	Analog input 3 +	Analog input 7 +	Analog output 3 +	Analog output 7 +
7	Gnd	Gnd	Gnd	Gnd
8	Analog input 4 +	Analog input 8 +	Analog output 4 +	Analog output 8 +
9	Analog input 1 -	Analog input 5 -	Analog output 1 -	Analog output 5 -
10	Gnd	Gnd	Gnd	Gnd
11	Analog input 2 -	Analog input 6 -	Analog output 2 -	Analog output 6 -
12	Gnd	Gnd	Gnd	Gnd
13	Analog input 3 -	Analog input 7 -	Analog output 3 -	Analog output 7 -
14	Gnd	Gnd	Gnd	Gnd
15	Analog input 4 -	Analog input 8 -	Analog output 4 -	Analog output 8 -

5.4.4. Monitoring Audio DA-15 Pinout

The monitoring audio DA-15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table.



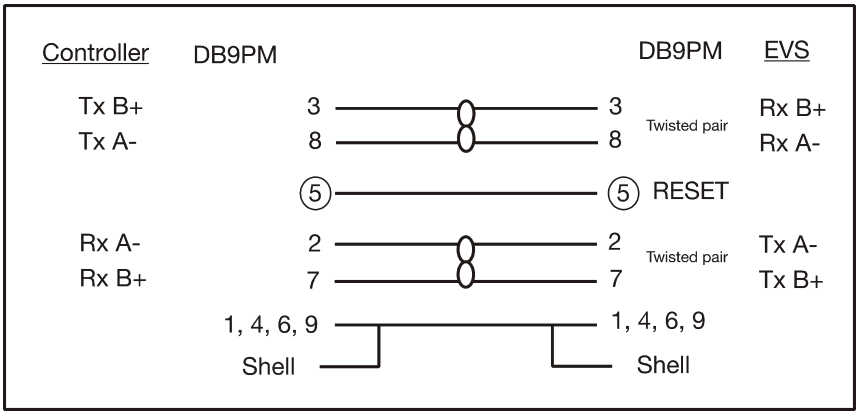
Pin #	DA-15 connector Outputs 1-4 (mono)
1	Gnd
2	Analog output 1 +
3	Gnd
4	Analog output 2 +
5	Gnd
6	Analog output 3 +
7	Gnd
8	Analog output 4 +
9	Analog output 1 -
10	Gnd
11	Analog output 2 -
12	Gnd
13	Analog output 3 -
14	Gnd
15	Analog output 4 -

5.5. RS422 Connections

5.5.1. RS422 Connector Pinout

The RS422 connectors are used to connect a remote control (from EVS or third party) to your server.

The cable wiring is a straightforward pin-to-pin connection as illustrated in the following diagram. You should use a shielded cable to avoid electromagnetic interference on long distances.



Warning
The RESET command line from the remote control is sent through the pin 5 of the RS422 connector. This function should be disabled when the controller on connector #1 is not an EVS controller.

The technical specification for the RS422 link is as follows:

- 19200 bauds
- No parity
- 8 data bits
- 1 stop bit

5.6. Gigabit Network

5.6.1. Functional Overview

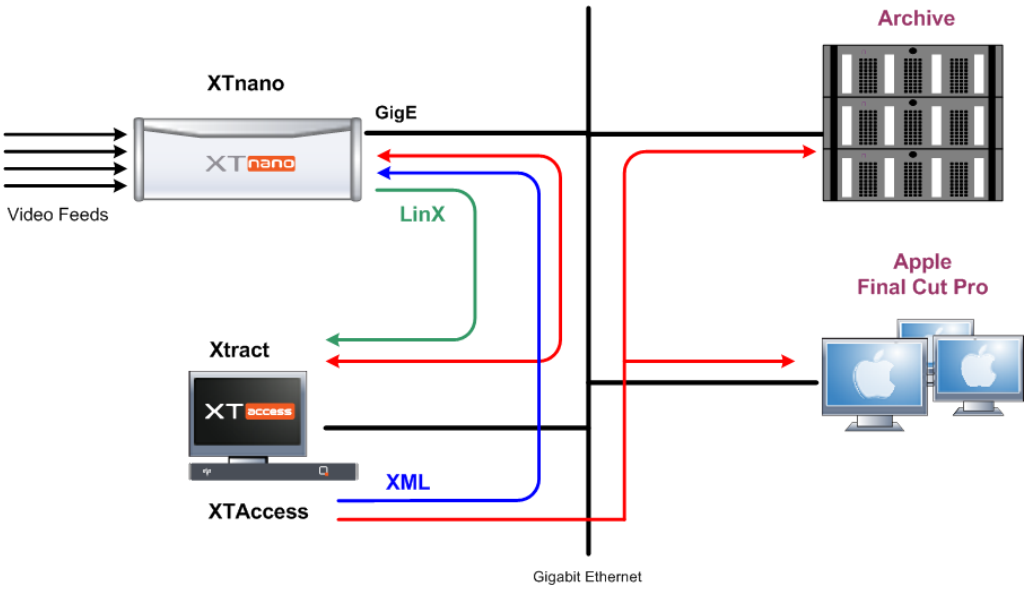
The Gigabit connection makes it possible to transfer video and audio material from your XTnano server to external systems via the TCP/IP network.

The external systems can be the following:

- A storage system or an archiving system, such as XStore.
- A non-linear editing system, such as Apple Final Cut Pro.

However, the external systems cannot read the raw files coming from a XTnano server. For this reason, XTAccess is used as a “gateway” between your server and the IT world. In this architecture, the Xsquare application plays the role of XTAccess orchestrator on the Gigabit network, communicating via the PC LAN connection.

Moreover, the XTnano is not able to directly send commands to the XTAccess. Consequently, a backup tool called Xtract is used as the interface to send commands to the XTAccess for file transfer operations and wrapping.



XT Access is directly connected to the XTnano servers through the Gigabit network. It runs on an XP workstation and is controlled, in this context, by Xtract via XML files.

The Gigabit connection fulfills the following functions in relation with the XTnano server:

- Backup of clips from an XTnano server.
- Restore of clips to an XTnano server.

Please refer to the Xtract user manual for more information on the backup from and restore of clips to the XTnano, using the Gigabit network, in combination with Xtract and XTAccess.

5.6.2. Important Rules

Gigabit networks including EVS servers need to abide by the following rules:

- The hardware used on GbE networks with EVS servers need to support jumbo frames.
- Both GbE ports of an EVS server need to be defined on different sub-networks.
- Teaming between the GbE1 and GbE2 ports is not possible.
- This is not possible to implement failover through the GbE network.
- The GbE port available on the MTPC board (PC LAN) is a 100Base-T port.

  This is used for monitoring purposes (XNet Monitor) or for the communication with other applications (LinX). This can be in the same sub-network as the GbE port.

5.6.3. Switches

1GbE Switches

All switches used on the GbE networks of EVS systems need to support jumbo frames (Ethernet frames with more than 1,500 bytes of payload).

The following table gives an overview on the supported 1GbE switches:

Type	Ports	Uplinks	Stackable	Jumbo Frames	Dual PSU
Cisco WS-2960S-24TD-L	24 10/100/1000 Base-T	2 10G SFP+ or 2 1G SFP	Yes	Switching	No
Cisco WS-2960S-48TD-L	48 10/100/1000 Base-T	2 10G SFP+ or 2 1G SFP	Yes	Switching	No
Cisco WS-2960S-24TS-L	24 10/100/1000 Base-T	4 1G SFP	Yes	Switching	No
Cisco WS-2960S-48TS-L	48 10/100/1000 Base-T	4 1G SFP	Yes	Switching	No
Cisco WS-3850X-24T-S	24 10/100/1000 Base-T	Module	Yes	Routing	Opt.
Cisco WS-3850X-48T-S	48 10/100/1000 Base-T	Module	Yes	Routing	Opt.
Arista 7048T-A	48 10/100/1000 Base-T	4 10G SFP+	No	Routing	Yes

Optional Modules for the Cisco WS-3850X

Product Number	Description
C3850-NM-4-1G	4 Gigabit Ethernet SFP
C3850-NM-2-10G	4 Gigabit Ethernet SFP / 2 10 Gigabit Ethernet SFP+
C3850-NM-4-10G	4 Gigabit Ethernet SFP / 4 10 Gigabit Ethernet SFP+

Remark: 4x10 Gigabit uplinks are only possible with the 48-port version, the 24-port version only supports 2x10GbE uplinks.

Recommendations

The models Cisco Catalyst 2960S-24TS and 2960S-48TS can be used for small setups where no inter-VLAN routing is needed and no 10G uplinks.

The models Cisco Catalyst 2960S-24TD and 2960S-48TD can be used for small setups where 10G uplinks are required, but no inter-VLAN routing is needed.

On larger setups, both GbE ports of the XTnano servers or/and several ports on the SANs are often used to increase the bandwidth or to allow redundancy. Since both GbE ports of an XTnano server cannot be used on the same sub-network, virtual LANs need to be created. To allow the transfer of packets between the virtual LANs, layer 3 switches are required. You need to select a layer 3 switch that is able to route jumbo frames. The Cisco Catalyst 3850X series does support jumbo frames, allows traffic to be routed between different VLANs and provides stacking capabilities.

Recommended SFP+ Modules

XTnano server TGE Module

- Intel® Ethernet SFP+ SR Optic (E10GSFPSR)
- Intel® Ethernet SFP+ LR Optic (E10GSFPLR)

Those modules are tested to be compatible with the TGE interface board of the XTnano server and the 10 Gbps SFP+ NICs equipped in some EVS servers.

Switches

On the switches it is recommended to use the modules recommended by the switch vendors.

5.7. GPIO Connections

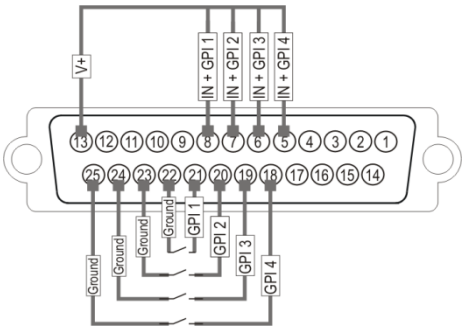
5.7.1. GP In Connections

GPI Triggers

The allocation of the XTnano server GPI triggers is performed in the Multicam Configuration window, in the GPI tab. See the Configuration manual for detailed information on allocating GPI triggers.

Opto isolated Inputs (GP In 1, 2, 3, 4)

Pin-Out



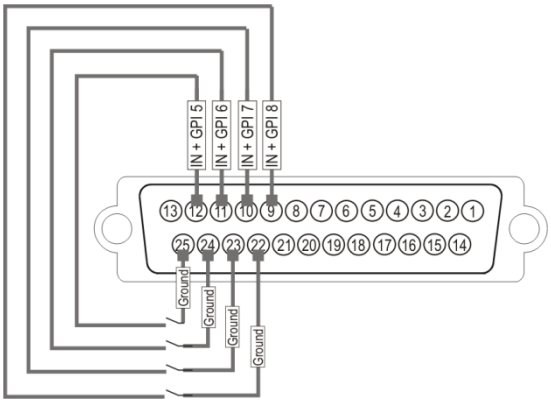
Specifications

- The input consists in an opto diode (VF @ 1.1 Volt) in series with a 470 ohm resistor.
- Typical switching point @ 1.4 mA, for secure operation:
  - i=0 to 0.5 mA -> opto OFF
  - i=2.5 to 30 mA -> opto ON
  - imax= 30 mA
- Direct connection to a TTL/CMOS signal possible (Pin opto - to GND and pin opto + to the TTL/CMOS signal).

  Typical switching point @ 1.6 Volts, for secure operation:
  - Vin< 0.8 Volts -> opto OFF
  - Vin> 2.2 Volts @ 2 mA -> opto ON
  - Vin max (without external resistor) = 15 Volts

TTL Inputs (GP In 5, 6, 7, 8)

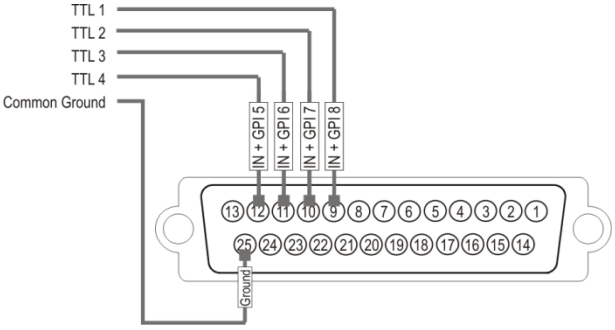
Relay Inputs Pin-Out



The relay must be connected between the ground and the corresponding TTL input on the DB-25.

TTL Inputs Pin-Out

Each TTL input on the DB-25 is directly connected to the pin of the TTL connector on the device triggering the GPI. The ground must be common between the DB-25 connector of the XTnano server and the external device.



Specifications

- each pin can be individually configured as an output or an input
- internal 4K7 pull up to +5 V
- low level Vi < 1.5 Volt (U12 = 74HC245)
- high level Vi > 3.5 Volt (U12 = 74HC245)
- optional TTL compatible level (U12 = 74HCT245)

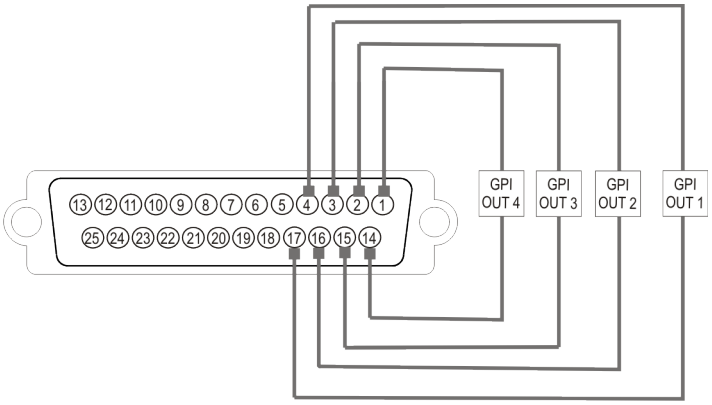
5.7.2. GP Out Connections

Relay Isolated Outputs (GP Out 1, 2, 3, 4)

Pin-Out

The user can define the functions, types and settings associated to the GPI outs in the following applications:

- Setup menu of the Remote Panel
- IP Director settings (GPI and Auxiliary Track tab)

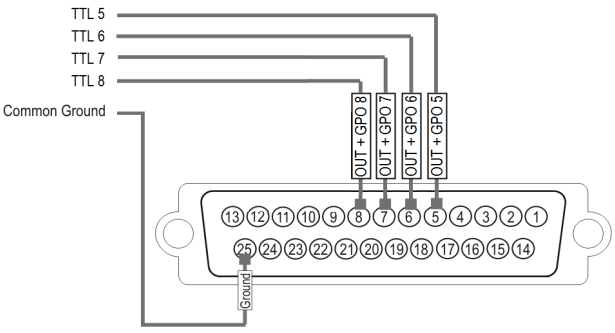


Specifications

- normally open contact (power off -> open)
- maximum 1 A
- maximum 50 Volts
- typical life time: 100.000.000 switchings

TTL Outputs (GP Out 5, 6, 7, 8)

Pin-Out


TTL 5
TTL 6
TTL 7
TTL 8
Common Ground
OUT + GPO 8
OUT + GPO 7
OUT + GPO 6
OUT + GPO 5
13 12 11 10 9 8 7 6 5 4 3 2 1
25 24 23 22 21 20 19 18 17 16 15 14
Ground

Specifications

- each pin can be individually configured as an output or an input
- internal 4K7 pull up to +5 V
- low level Vi < 1.5 Volt (U12 = 74HC245)
- high level Vi > 3.5 Volt (U12 = 74HC245)
- optional TTL compatible level (U12 = 74HCT245)

6. Boards Description

6.1. Boards and Slots Configuration

The XTnano server is equipped with several boards that are all developed by EVS.

According to your server version, the following setup configurations are available:

NEW !

4U Rack

Slot #	Installed boards	
	4 video channels	2 video channels
6	RSAS	
5	H3X or H3XP	
4	CODA or A3X (Audio Codec)	
3	V3X (SD/HD) #2	—
2	V3X (SD/HD) #1 Genlock	V3X (SD/HD) #1 Genlock
1	MTPC	

6.2. V3X Video and Reference Boards

6.2.1. Description

Overview

The V3X board is divided in several parts:

- a base board identified as V3X base (rear section and center extension)
- two modules identified as COD A V3X (front left) and COD B V3X (front right)

Warning
It is highly advised not to remove a V3X board from your EVS server. Should you have to do so, manipulate the board very carefully, making sure it is not exposed to mechanical or electric shocks.

COD Modules

The COD A V3X and COD B V3X modules are the actual codec modules, each of them being able to be configured by software either as an encoder (for a record channel) or as a decoder (for a play channel). The COD V3X modules are SD, HD.

They support the following feature(s):

- Full resolution 3D HD on a single V3X module (Dual Link HD SDI)

Genlock

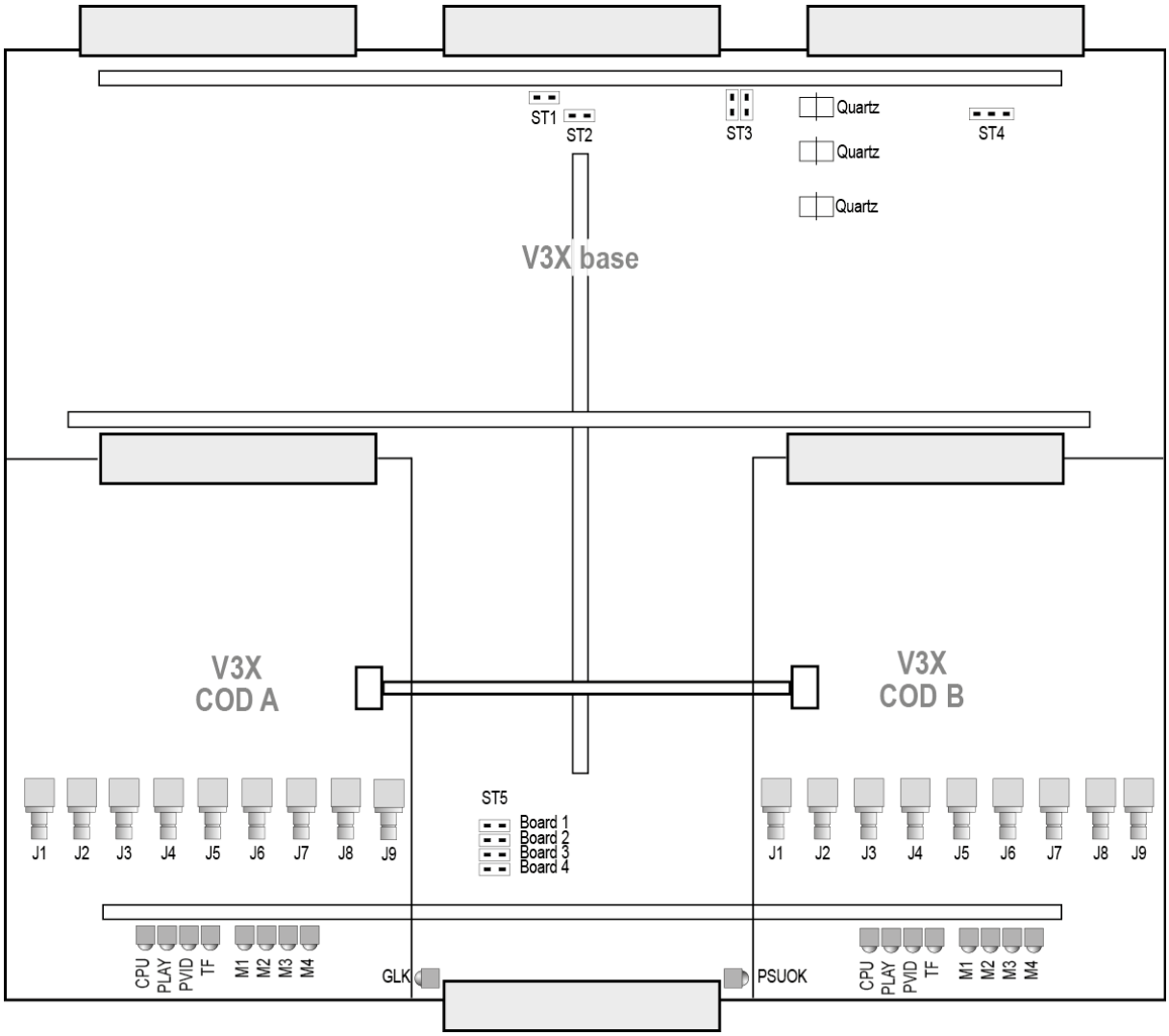
There are 2 versions of the V3X board: one with genlock, one without genlock.

The genlock model can easily be identified by the presence of 3 quartz synthesizers at the rear of the V3X base board, on the right-hand side, and by the presence of the GLK and PSU OK LEDs on either side of the DIN connector at the center front of the board.

Note that a V3X board with genlock must be installed as V3X #1 in first position (slot 2) in the server. A V3X board with genlock can never be installed in any other slot, and thus cannot be used instead of V3X #2. Doing so will result in conflicting electrical signals inside the system.

Block Diagram

The block diagram of the V3X board with genlock is illustrated hereunder with the connectors, jumpers and LEDs location:



Base Board Jumpers

The following table lists the V3X base board jumpers and their respective function:

Jumper	Function
ST1, ST2	These 2 jumpers must be installed on the last V3X board of the server (that is on V3X #1, 2 if there are respectively 1, 2 V3X boards installed in the server).
ST3 (SPARE)	«Parking» for ST1 and ST2 jumpers when they are not used.
ST4 (only on V3X with genlock)	Must be set to HiZ (or not installed). Note that the Genlock Loop connector on the back panel of the server (if available) must always be terminated with a 75 Ohm load if it is not used.
ST5	Defines the position of the board inside the server. It must be set to « 1 » for a V3X with genlock, and to « 2 » for a V3X board without genlock, depending on its position in the server.

Base Board LEDs

The table below lists the LEDs available on the V3X base board with the genlock functionality.

Warning
It is crucial to have a continuous and stable genlock signal when the server is in operation. In case of interferences on the genlock signal that would cause parity violations, the recorders will automatically be restarted to maintain data integrity.

LED	Color	Status	Function
GLK	—	Off	The genlock module is not initialized.
	Green	Blinking	The genlock module is properly initialized, but no valid genlock signal is detected.
		On	The module is initialized and a valid genlock signal is detected.
	Red	Blinking	There is a genlock problem.
		On	A resync is needed.
PSU OK	Green	On	All voltages are present and in the allowed range.
	—	Off	There is a voltage problem.

V3X COD Modules LEDs

The following table lists the LEDs available on then V3X COD modules (from left to right):

LED	Color	Status	Function
CPU	Green	Blinking	Indicates CPU activity.
		On	There is a problem with the module processor.
PLAY	Green	On	The module is set in play mode by the software.
		Off	The module is set in record mode.
PVID	Green	On	A valid video signal has been detected on the J8 connector (SD/HD SDI input), whether the module is in play or record mode.
TF (transfer)	Green	Blinking	Data transfers occur between the module and the H3X board.
M1	—	—	Not used.
M2			
M3			
M4			

6.2.2. COD Connectivity in SD and HD

Connector Assignments

This section describes the connector assignments and layout for the video standards SD 525i, SD 625i, HD 1080i and HD 720p.

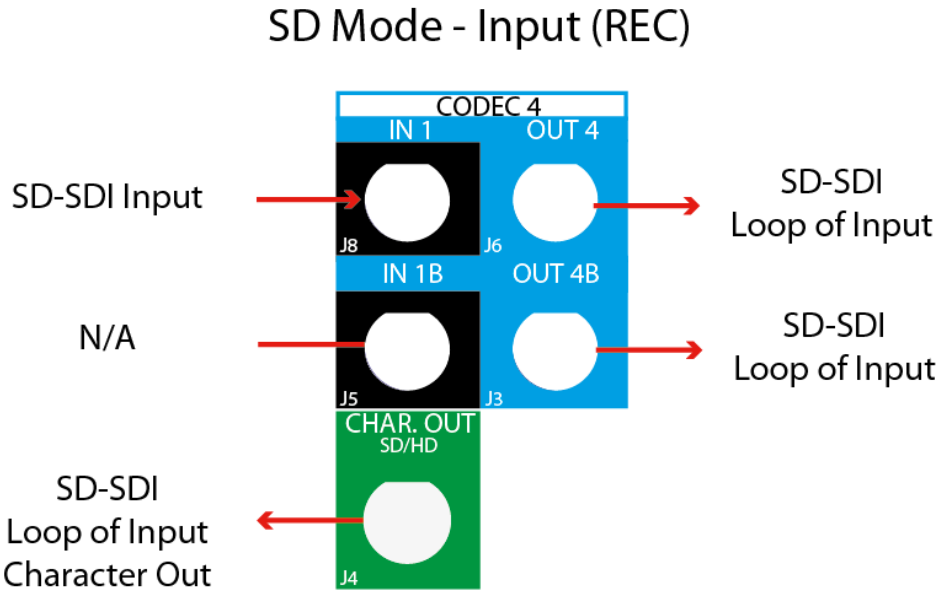
The specific connectivity for HD 3D Dual Link is described in the following sections.

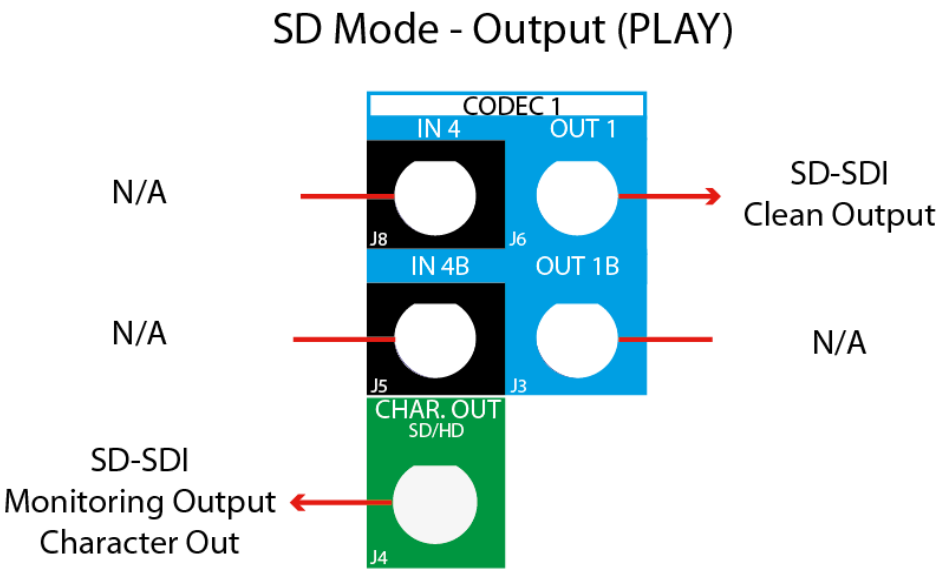
Connector	SD mode	HD mode	Connector label
J1	Not used	Not used	CHAR SD
J2	SDI monitoring output (SD)	SDI monitoring output (HD)	Not wired to the backplane. Used for onboard multiviewer input.
J3	Loop-through for the SDI input signal (SD)	Loop-through for the SDI input signal (SD, down-converted)	OUT B

Connector	SD mode	HD mode	Connector label
J4	SDI monitoring output (SD)	SDI monitoring output (SD/HD)	CHAR OUT SD/HD
J5	Not used or SDI input (SD) in an XREC configuration	Not used or SDI input (HD) in an XREC configuration	IN B
J6	SDI program output	HD SDI program output	OUT
J7	Not used	Not used	OUT
J8	SDI input (SD)	HD SDI input (HD)	IN
J9	Alternate SDI input (SD, for the internal loop)	Alternate HD SDI input (HD, for the internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

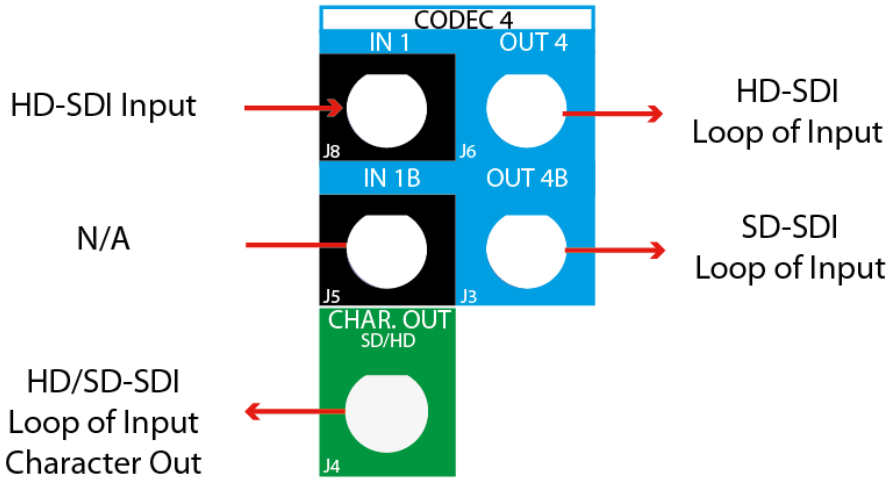
Note
The loops of the input signal are not genlocked.

Connector Layouts

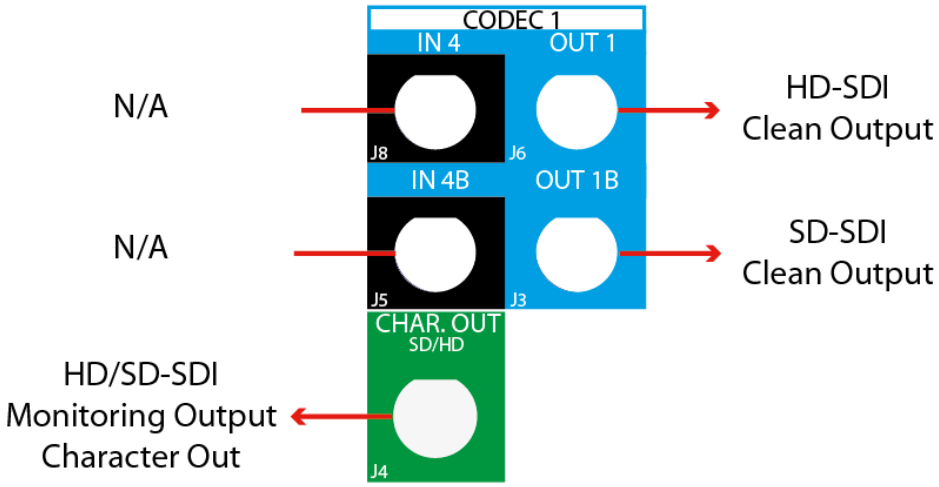




HD Mode - Input (REC)



HD Mode - Output (PLAY)



6.2.3. COD Connectivity in 3D and 1080p Dual Link

NEW !

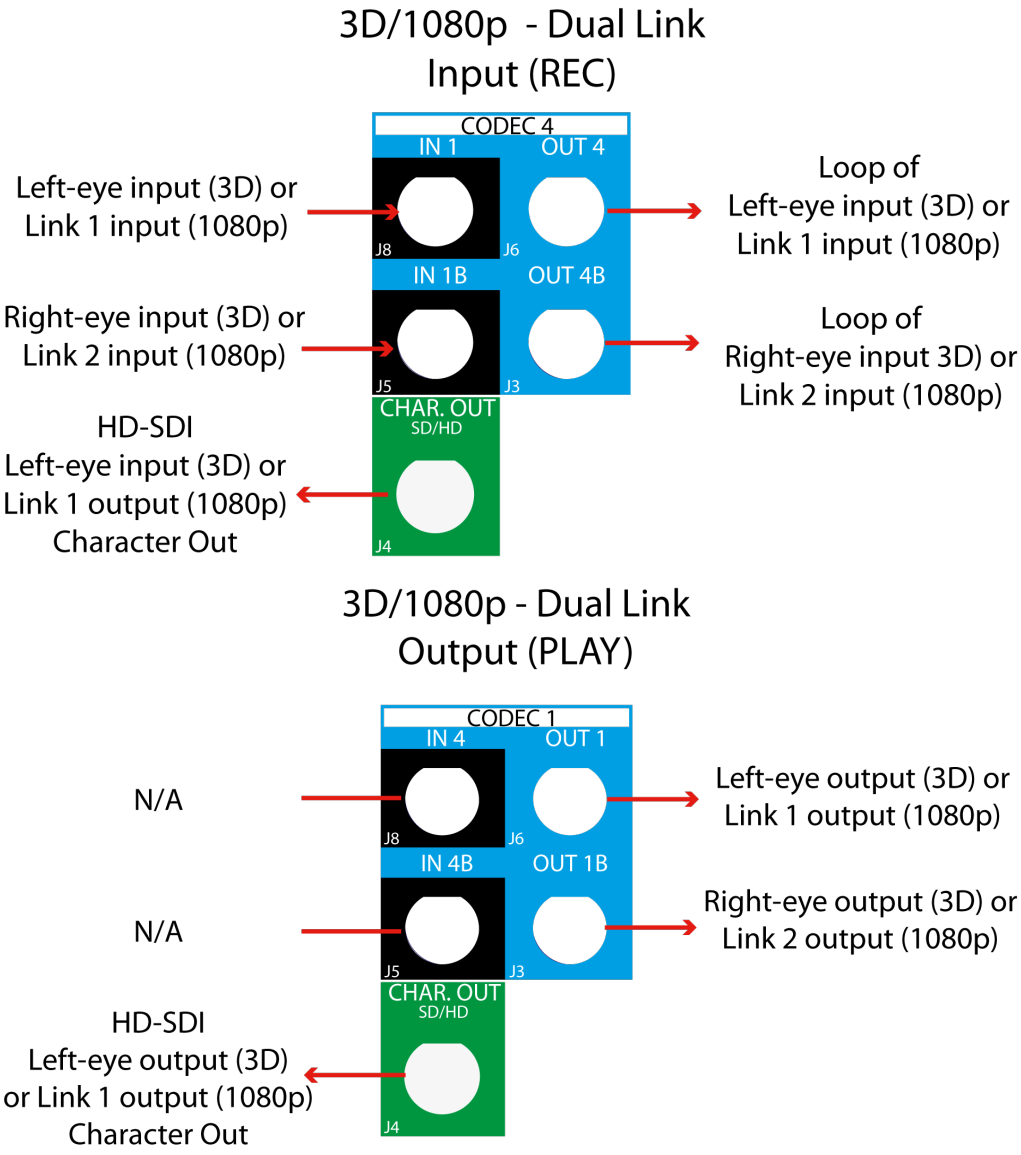
Connector Assignments

This section describes the connector assignments and layout for the video standards HD 3D and 1080p in Dual Link mode.

Connector	3D/1080p mode	Connector label
J1	Not used	CHAR SD
J2	SDI monitoring output (HD)	Not wired to the backplane. Used for onboard multiviewer input
J3	HD SDI program output for right eye (3D) or link 2 (1080p) (HD)	OUT B
J4	SDI monitoring output for left eye (3D) or link 1 (1080p) (HD/SD)	CHAR OUT SD/HD
J5	HD SDI input for right eye (3D) or link 2 (1080p) (HD)	IN B
J6	HD SDI program output for left eye (3D) or link 1 (1080p)	OUT
J7	Not used	OUT
J8	HD SDI input for left eye (3D) or link 1 (1080p) (HD)	IN
J9	Alternate HD SDI input (HD, for the internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

Note
The loops of the input signal are not genlocked.

Connectors Layouts



6.2.4. COD Connectivity in 3D and 1080p Single Link 3G-SDI

NEW !

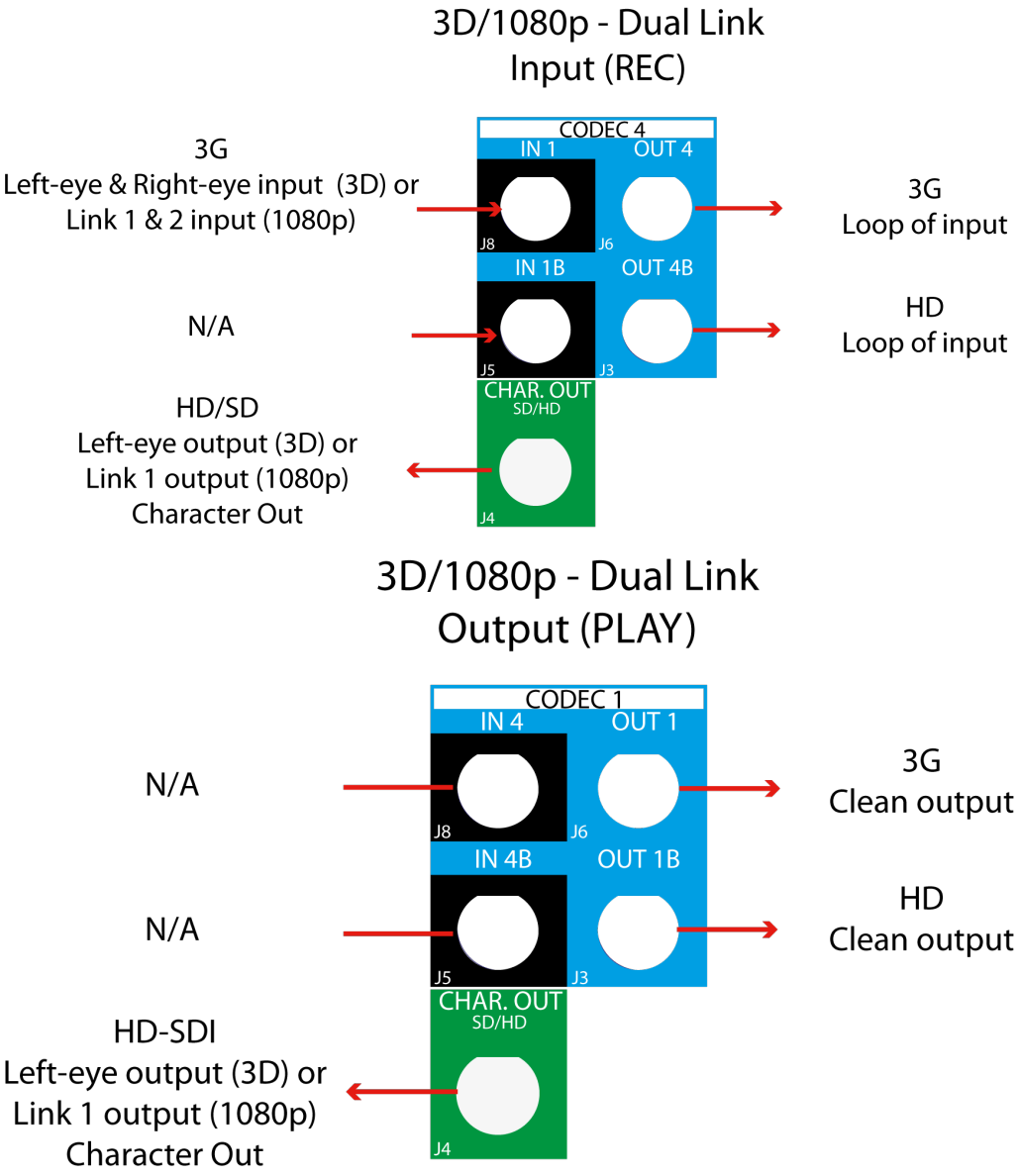
Connector Assignments

This section describes the connector assignments and layout for the video standards HD 3D and 1080p in Single Link 3G-SDI mode.

Connector	3D/1080p Mode	Connector label
J1	Not used	CHAR SD
J2	SDI program output 2D (HD)	Not wired to the backplane. Used for onboard multiviewer input
J3	SDI program output 2D (HD)	OUT B
J4	SDI monitoring output for left eye (3D) or link 1 (1080p) (HD/SD)	CHAR OUT SD/HD
J5	Not installed	IN B
J6	3G-SDI program output for left & right eyes (3D) or link 1 & 2 (1080p) (3G, identical to J7)	OUT
J7	Not used	OUT
J8	3G-SDI input left & right eyes (3D) or link 1 & 2 (1080p) (3G)	IN
J9	Alternate 3G-SDI input (3G, for the internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

Note
The loops of the input signal are not genlocked.

Connectors Layouts



6.2.5. Channel Assignment

Server with Two Codec Boards

The following table shows how the channels (play or record channels) are assigned to the codec boards and connectors:

Codec Board	Codec Connector	Channel Number
Lower codec board (slot 2)	COD A	CAM D or PGM 1
Lower codec board (slot 2)	COD B	CAM C or PGM 2
Middle codec board (slot 3)	COD A	CAM B or PGM 3
Middle codec board (slot 3)	COD B	CAM A or PGM 4

Server with a Single Codec Board

The following table shows how the channels (play or record channels) are assigned to the codec board and connectors:

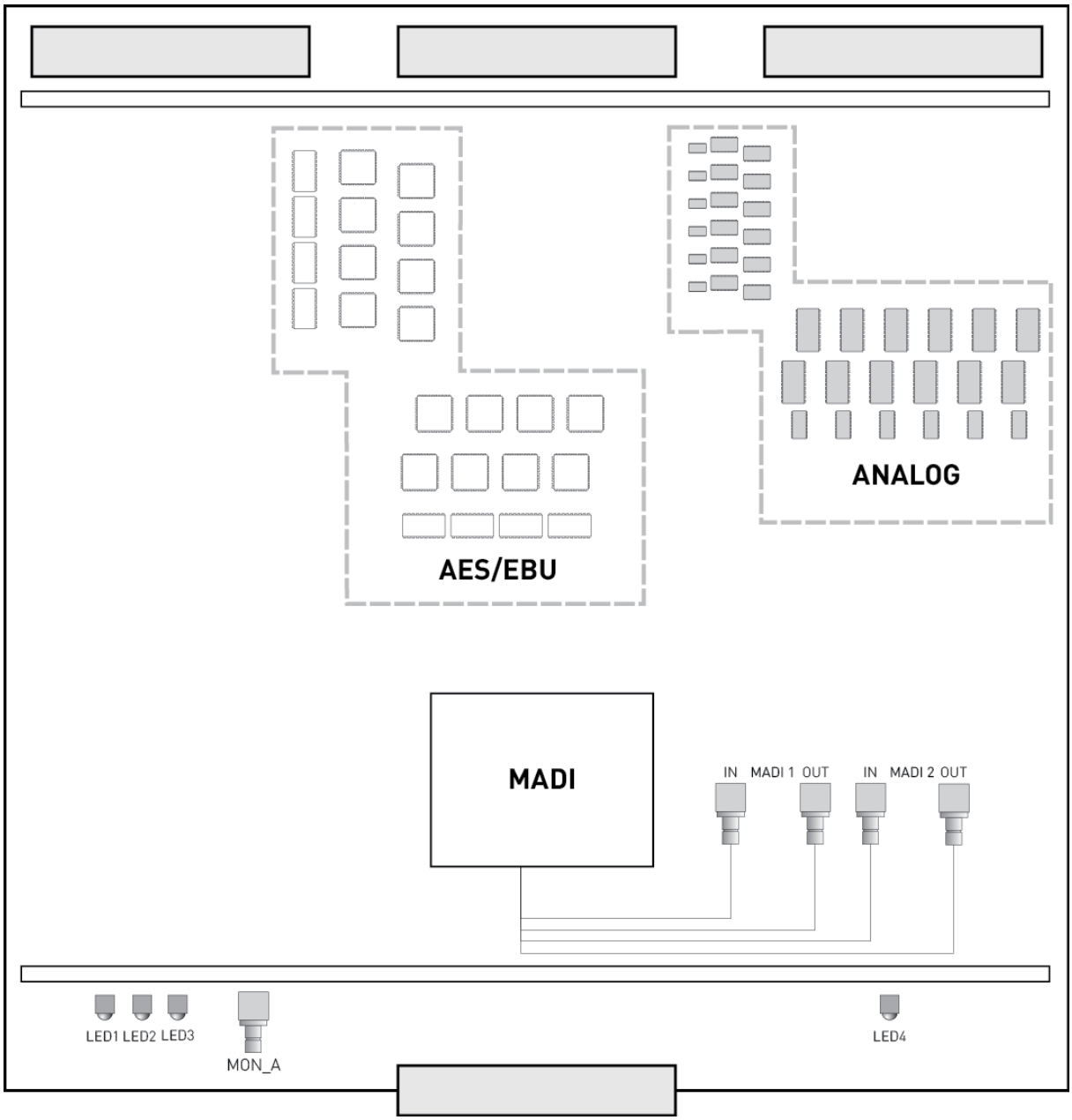
Codec Board	Codec Connector	Channel Number
Lower codec board (slot 2)	COD A	CAM B or PGM 1
Lower codec board (slot 2)	COD B	CAM A or PGM 2

6.3. Audio Codec Board

NEW ! The audio codec board (A3X) is the audio interface between the V3X boards and the H3X/H3XP board. Video codec and audio codec boards are tied to the H3X/H3XP board with one bus connector on the front side. Different audio configurations are available with the audio codec board. See section "Audio Connections" on page 32 for details.

The following LEDs are available on the audio codec board:

- LED 1-3: internal EVS information only.
- LED 4: transfer activity to/from the H3X/H3XP board.

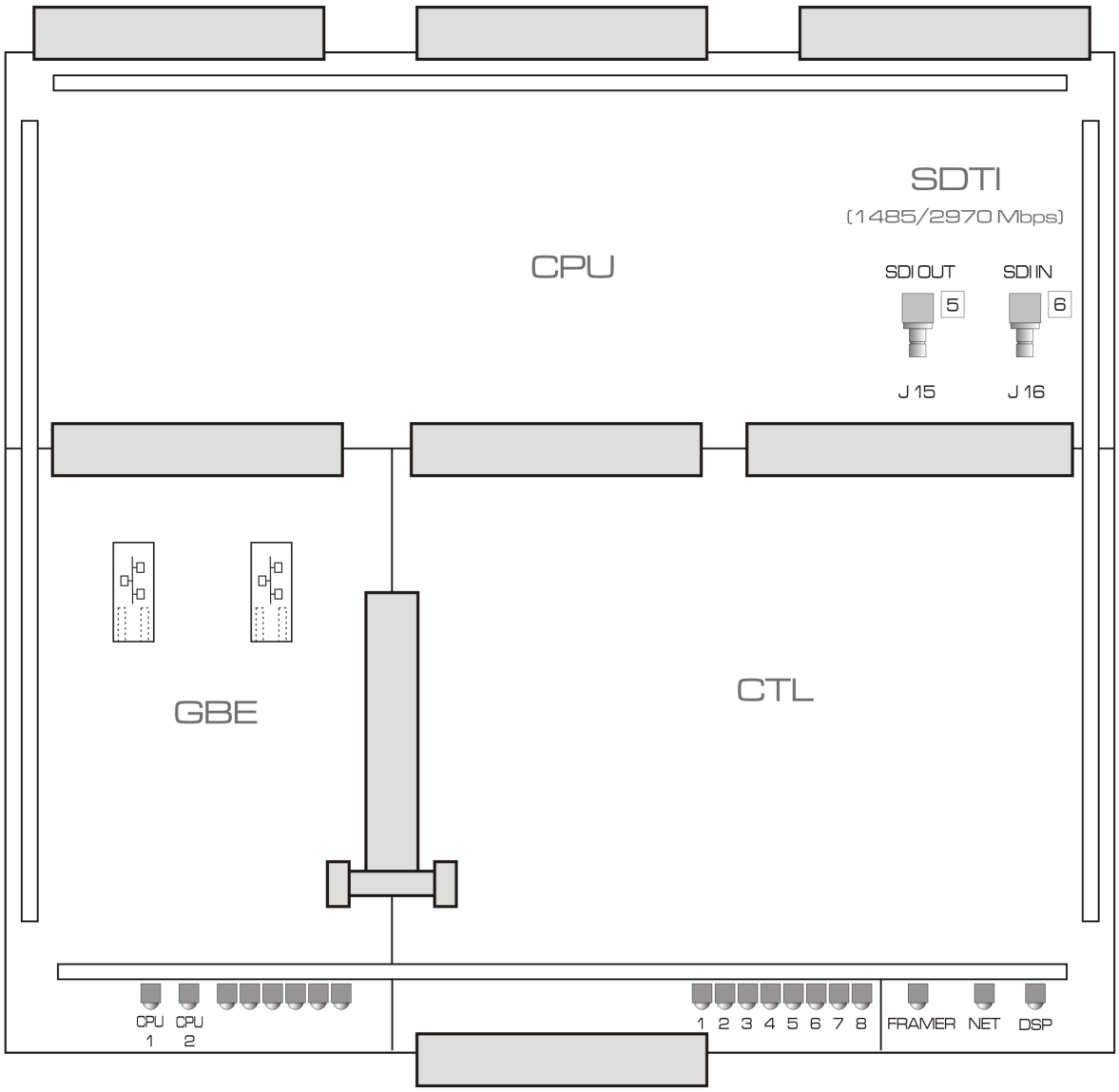


6.4. Controller Boards

6.4.1. H3X Board

The H3X board is divided in 4 parts (2 in front, 2 in the back).

- Front left: GbE module.
- Front right: CTL controller module.
- Back left: CPU module.
- Back right: not installed (SDTI).



LEDs Function

The available LEDs linked to SDTI controller module are, from left to right:

LED	Color	Status	Function
LED 1	Green	On	Ok.
	Red	On	An error occurred while booting the H3X board.
LED 2 to LED 8	—	—	For EVS internal use only.
FRAMER	Green	On	Not used.
NET	Green	On	Not used.
DSP	Green	Blinking	Indicates DSP activity (audio processing).

The available LEDs linked to the CPU module are, from left to right:

LED	Color	Status	Function
CPU1 CPU2	Green	Blinking	These LEDs blink alternately every 250 milliseconds to indicate that the processor is running.
Other LEDs	—	—	For EVS internal use only.

Gigabit Connectors

The two board Gigabit connectors are connected to the two backplane Gigabit ports.

The Gigabit connectors must be on a network that supports Jumbo Frames of (at least) 9014 bytes Ethernet frames. See section "Switches" on page 39 for the list of supported switches.

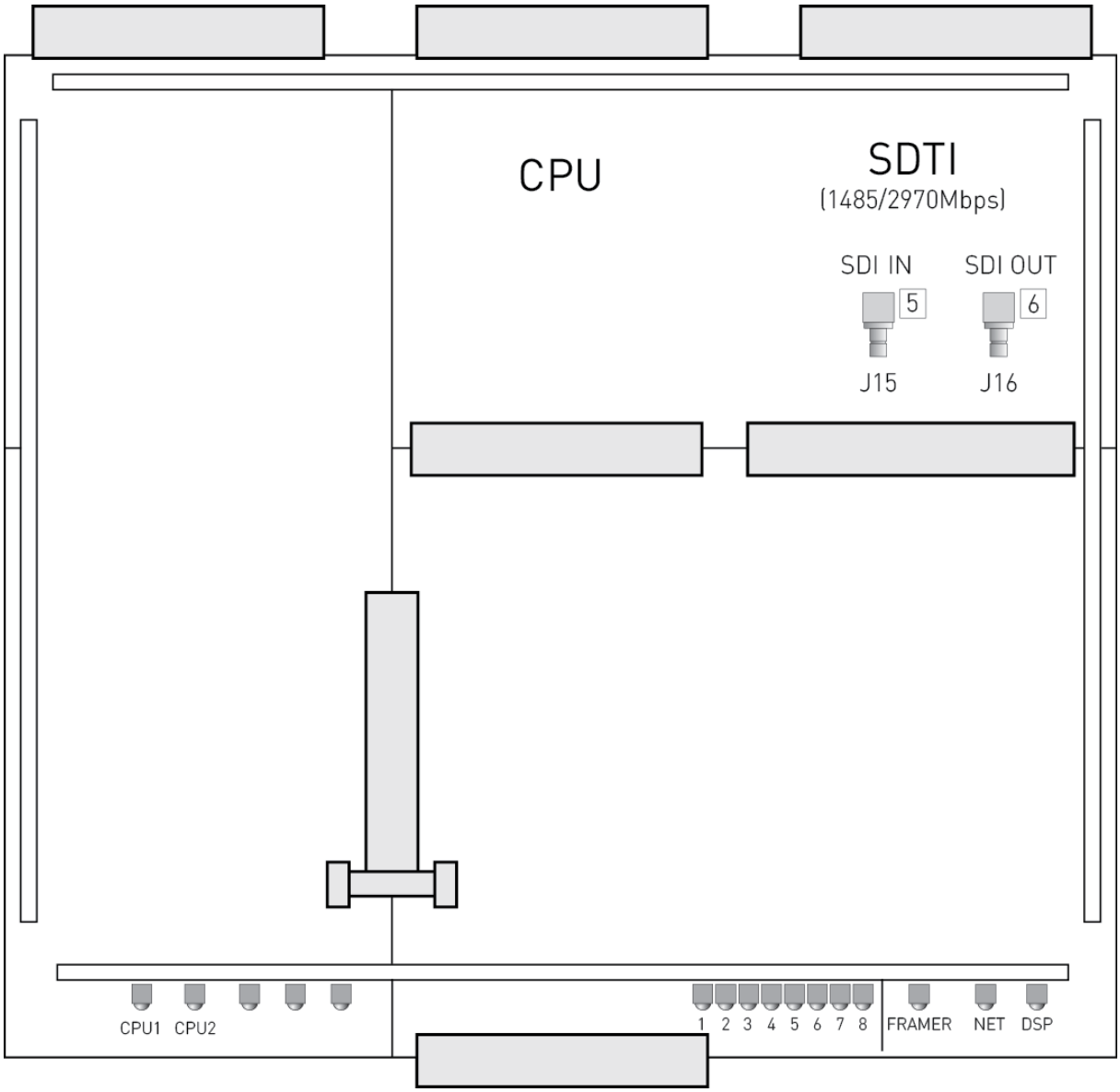
You can set up the GbE IP addresses in the Multicam Configuration window, in the Network tab, Gigabit Ethernet section.See the Configuration manual for more information.

6.4.2. H3XP Board

NEW !

The H3XP board is divided in 4 parts:

- Back center: CPU module.
- Back right: not installed (SDTI).
- Left: not used currently
- Front center and right: not used currently



LEDs Function

The available LEDs linked to the SDTI controller module are, from left to right:

LED	Color	Status	Function
LED 1	Green	On	Ok.
	Red	On	An error occurred while booting the H3X board.
LED 2 to LED 8	—	—	For EVS internal use only.
FRAMER	Green	On	Not used.
NET	Green	On	Not used.
DSP	Green	Blinking	Indicates DSP activity (audio processing).

The available LEDs linked to the CPU module are, from left to right:

LED	Color	Status	Function
CPU1 CPU2	Green	Blinking	These LEDs blink alternately every 250 milliseconds to indicate that the processor is running.
Other LEDs	—	—	For EVS internal use only.

6.5. RAID Controller Boards

6.5.1. RSAS Board on SAS Disk Array

Disk Arrays on systems with H3X boards have a controller on the disk array board.

Different configurations can be used

- One internal array with a series of 6 disks
- No internal storage

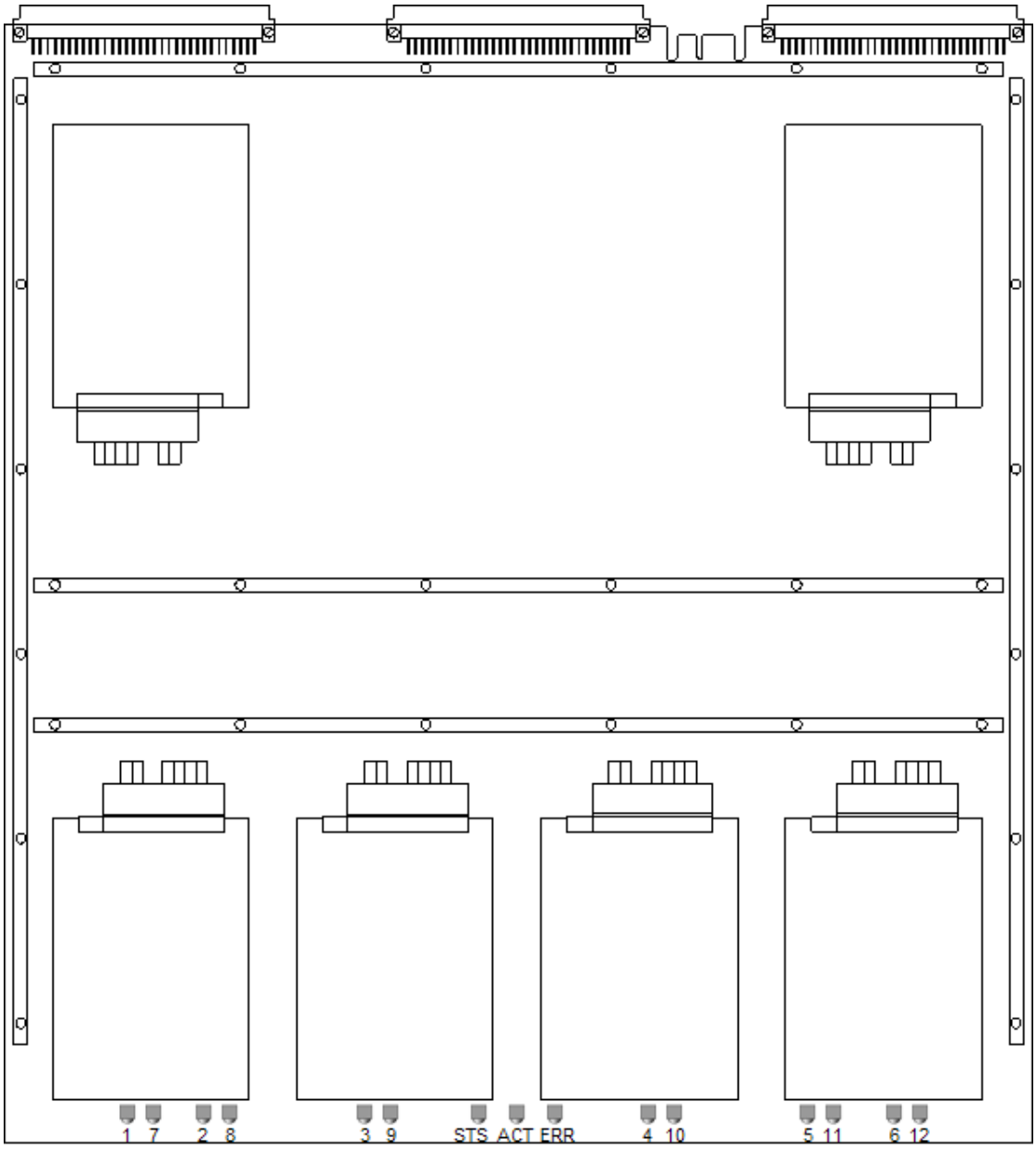
LEDs on Internal Array

LEDs 1 to 6 are used in case of one internal array of 6 disks.

LEDs correspond to the disks as schematized as followed:

1			6
2	3	4	5

LED	Status	Function
Disk LEDs	Off	the corresponding disk is not started (not spinning)
	On, fast blinking (green)	the corresponding disk is starting (spinning)
	On, steady (green)	the corresponding disk is started and used in the RAID array
	On, slowly blinking (green)	the corresponding disk is started but not used in the RAID array
STS	On (green)	the RSAS RAID controller is properly booted.
ERR	On (red)	errors occur during the data transfer between the RAID controller and the disks



6.6. MTPC Board

Introduction

The function of the PC board is mainly the control of the video hardware and the interface of the peripheral equipment (such as a remote controller) with the video hardware.

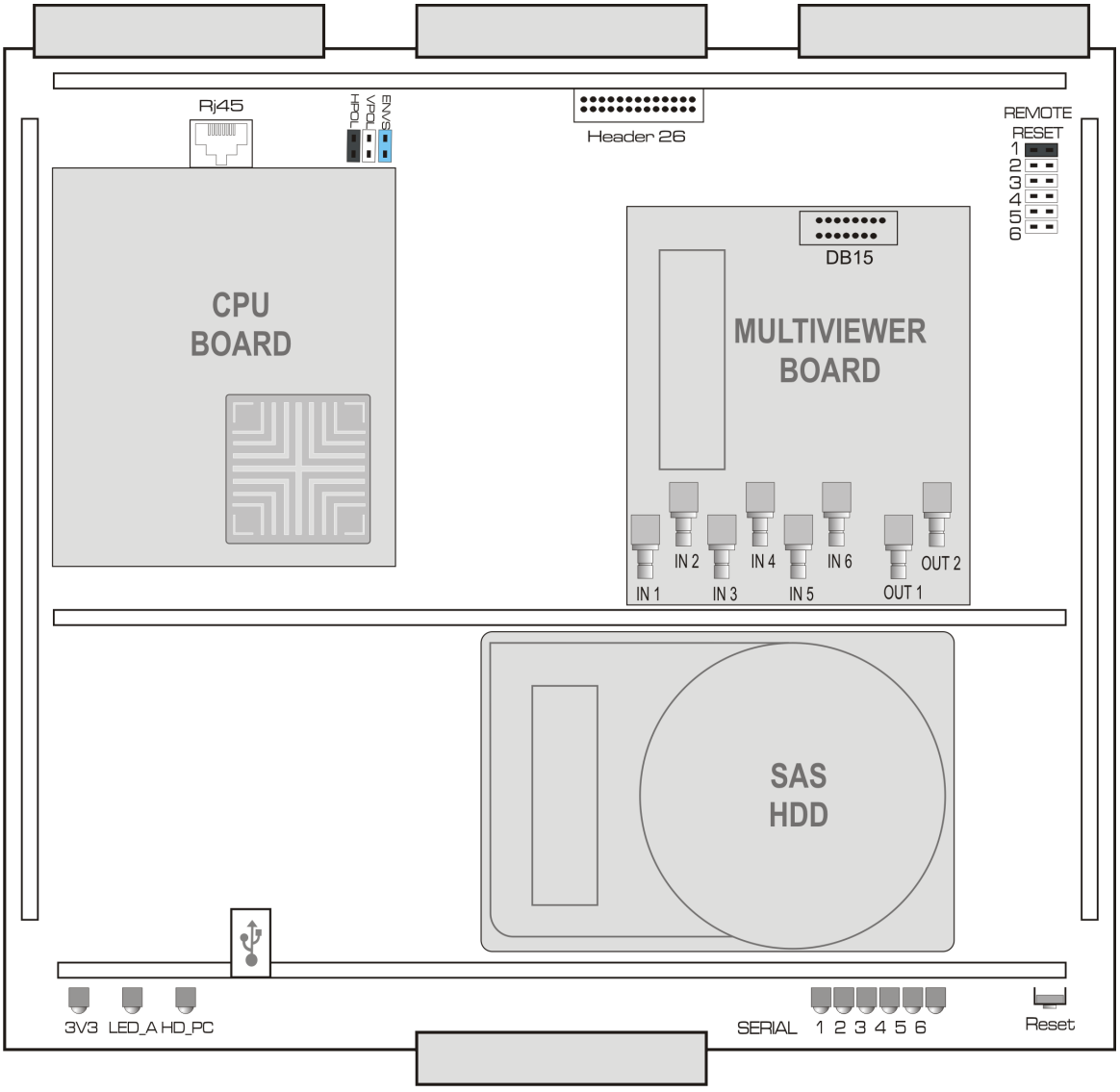
The following MTPC board is used:

- Revision A3/A6 with COMMEL HS873 motherboard and a new time code management module (with bootable USB).

In standard configuration the PC hardware is composed of:

- One mounting PC board, with serial ports, LTC reader and generator, is controlled by the motherboard.
- SAS System Hard disk: the SAS disk drive is used for storing the EVS software and the DOS operating system. Neither audio nor video data is saved on this disk. The capacity of this drive may vary depending on market availability, but the system partition is always set to 2 GB. The remaining capacity of this drive is not used.
- 256 MB SDRAM (or higher) to suit the system requirements from Multicam 12.00. Please contact EVS support for RAMs upgrade. Do not use standard PC RAM modules.

Illustration



Multiviewer

The multiviewer board is an option on XTnano servers.

Connectors	Function
IN	The J2 connectors from the CODEC modules of the COHX board are connected to the IN connectors of the multiviewer board.
OUT1	The OUT1 connector of the multiviewer board is connected to the MULTIVIEWER 1 connector on the rear panel of the server.
OUT2	The OUT2 connector of the multiviewer board is connected to the MULTIVIEWER 2 connector on the rear panel of the server.
DA-15	The DA-15 connector of the multiviewer board is connected to the MULTI DA-15 connector on the rear panel of the server.

LED Information

Internal EVS information

Board Configuration

HPOL, VPOL and ENVS are used to configure the composite sync generator used in LSM TV mode (no effect if the server is only used with a VGA monitor).

The HPOL jumper can be used to invert or not the VGA HS signal (Horizontal Sync) to generate the composite output signal (TV mode)

The VPOL jumper can be used to invert or not the VGA VS signal (Vertical Sync) to generate the composite output signal (TV mode)

The ENVS jumper can be used to enable or not the presence of the VGA VS signal (Vertical Sync) in the composite output signal (TV mode)

If the LSM TV mode is used, these jumpers must be set up according to EVS recommendations, which depend on software version and CPU board model/revision:

Set up the jumpers as follows:

- HPOL=On; VPOL=Off; ENVS=On

REMOTE RESET jumpers are available to designate the remote(s) from which the RESET command can be sent.

This command resets the whole system: PC and video hardware.

In standard configuration only Remote one (on RS422 port 1) is allowed to reset the system.

Warning
This jumper should be removed if the device connected to the RS422 port is NOT an EVS controller. Maximum voltage on pin 5 of an RS422 port of the server should not exceed 5 Volt when the corresponding jumper is engaged. Applying a higher voltage on pin 5 when the corresponding jumper is engaged will result in permanent electronic damage to the board.

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